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**FINAL REPORT**

20030401

**SPRING WHEAT CULTIVARS FOR ORGANIC  
PRODUCTION**

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**ADF PROJECT # 20030401** (20030109)

**"SPRING WHEAT CULTIVARS FOR ORGANIC PRODUCTION"**

**Final Report**

**January 1, 2004-February 16, 2009**

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## **ABSTRACT**

Economic and environmental pressures are spurring the study of alternate weed control strategies such as the development of competitive crop cultivars. The primary objective of this research was to determine whether western Canadian spring wheat (*Triticum* sp) cultivars and advanced generation breeding lines differ in their ability to compete against model weeds. A total of 48 wheat cultivars were grown in the absence or presence of simulated weed competition conditions over a three year period. Weeds consisted of cultivated oat (*Avena sativa*) and oriental mustard (*Brassica juncea*). Significant ( $P=0.01$ ) weed by cultivar interactions involving changes in cultivar rank were detected for wheat grain yield. The highest yielding cultivars under weed-free conditions were not necessarily the highest yielding under weedy conditions. Cultivars which suffered smaller yield reductions were more effective in limiting oat and mustard grain yields. During the course this project 274 advanced generation bread wheat breeding lines from the CDC were evaluated at least once. Of these 274 lines, two were evaluated for competitive ability for three years and, in parallel, entered in cultivar registration tests. One of these lines could potentially be brought forward for Support of Registration. Over-all, however, cultivars and breeding lines selected in the absence of weed pressure appear to provide little scope for selecting more competitive cultivars that might be of use in organic production systems. Experimental lines developed under model weed pressure using divergent selection will provide a tool to assess the effectiveness of developing spring wheat germplasm that might be better suited to organic or reduced input production scenarios.

## **INTRODUCTION**

### **Background Information**

One of the major inputs for spring wheat production in Saskatchewan is herbicide. Herbicides are the primary method of weed control in spring wheat. Two decades ago, herbicide use in western Canadian wheat production was estimated to cost roughly \$150 million per year while yield reductions due to uncontrolled weeds resulted in a further \$200 to \$1,000 million in lost revenue annually (Ashford and Hunter, 1986; Holm and Kirkland, 1986). Currently, the costs of herbicides, application cost and wheat yield reduction (estimated at 10%) due to uncontrolled weeds in western Canada is estimated to be approximately CDN \$460 million. In light of economic and environmental pressures and the buildup of herbicide resistant weeds, there is a need for alternate weed control strategies. One of these strategies consists of raising the crop's level of competitiveness against weeds (Richards, 1989). The increased interest in selecting more competitive wheat genotypes has been reviewed in detail by Lemerle et al. (2001) and Mason and Spaner (2006).

Cultivars that are better suited for production in systems that do not use chemical weed control (e.g. organic crop production) or rely on an integrated weed management (IWM) approach are desirable. An IWM approach involves the use of cultural practices

in conjunction with reduced rates of environmentally benign herbicides coupled with more competitive wheat genotypes (Huel 1998). Concerted breeding efforts over the last 70 years to develop disease and insect resistant spring wheat cultivars have helped reduce input costs for producers in western Canada. A similar approach could be used for developing wheat cultivars better able to compete against weeds. Genotypic differences in the ability to suppress weeds have been reported in wheat (Challaiah et al., 1986; Richards, 1989). Evidence suggests that high yielding semi dwarf cultivars of wheat are more susceptible to yield losses due to weed interference than standard height cultivars (Kirkland & Hunter, 1991). Differences in competitive ability have been associated with early seedling vigor, height, tillering ability, leaf length and spread, ground cover, and nutrient uptake efficiency. Huel and Hucl (1996) reported a 40% difference in the competitive ability of morphologically diverse experimental spring wheat genotypes subjected to competition from model weeds. Domesticated species were used as weeds instead of their wild counterparts in order to achieve more uniform plant populations (Huel and Hucl, 1996).

The primary objective of this project was to determine whether spring wheat cultivars differ in their ability to compete against model weeds. Secondly, we wanted to determine whether we could identify breeding lines with increased competitive ability and thirdly select wheat lines from segregating populations challenged with model weeds.

## **METHODS AND RESULTS**

### **METHODS**

#### **Wheat varietal experiment (2004 to 2006)**

In the wheat varietal evaluation experiment, 40 spring wheat, five durum and one spring spelt cultivar were evaluated along with a single triticale (*Triticosecale*) and a single barley cultivar in each of three years (2004 to 2006). Barley has long been known to be more competitive than wheat (Pavlychenko and Harrington, 1934) and was thus included as a control.

All three years of this experiment were conducted at the Kernen Crop Research Farm (KCRF) at Saskatoon, Saskatchewan. The soil type was a clay-loam.

The seeding dates for the wheat varietal experiments were 25, 26, and 23 May in 2004, 2005 and 2006, respectively.

The model weed species were tame oat (*Avena sativa* L.) cultivar 'Waldern' and the oriental mustard (*Brassica juncea* L.) cultivar 'Cutlass'. The model weeds were cross-seeded over half of each replication using a seeding rate of 55 seeds m<sup>-2</sup> for each of the weed species. The model weeds were sown slightly shallower to avoid mixing by the seeder and were sown perpendicular to the wheat. The non-weedy plots were driven over

with the seeder in the ground to provide equal soil packing and disturbance for both weedy and non-weedy treatments.

Each plot consisted of five rows spaced 20 cm apart. Instead of cross-seeding across each 3.6 m long plot, back to back weedy versus non-weedy 3.6 m-length plots were seeded within a replication and the weeds seeded across one of the blocks. The position of the weedy versus non weedy blocks was randomized within a replication (i.e. front versus back) but cultivars were stripped across weedy versus non-weedy treatments.

The non-weedy treatment was treated with Buctril M (560 g a ha<sup>-1</sup>) when the wheat reached the 4-leaf stage using a tractor-mounted plot sprayer. The herbicide solution was applied at a pressure of 276 kPa with 8001 flat fan nozzles. The herbicide was applied in 100 L of water ha<sup>-1</sup>.

Fertilizer (11-51-0) was drilled in with the wheat seed at a rate of approximately 50 kg ha<sup>-1</sup>. The experiments were established on fallow land. Cultivar seeding rates of 313 seeds m<sup>-2</sup> were used. Seeding rates were adjusted for germination.

A Randomized Complete Block Design in a strip plot arrangement was used. The main plot (horizontal stripping) was assigned to weed treatments (presence versus absence) and the subplot to cultivars. For the varietal comparison study the number of replications was  $r=6$ . Measurements on the wheat cultivars, other than grain yield, were carried out on the non-weedy (control) treatment only. Days to 50% spike emergence were measured on four replications in 2004 and 2005 and six replications in 2006 while days to physiological maturity were measured on four replications each year. Plant height was measured on a single replication in 2004 and six replications in 2005 and 2006 while lodging was recorded for two (2004, 2005) or six replications (2006).

Seedling counts were carried out on a random sub sample of plots.

At maturity, plots were harvested with a plot combine and the grain was dried down to a moisture content of 10±1% in forced air driers.

Grain samples were run over a 26 hole riddle and a 5/64 round sieve in a Carter-Day dockage tester (Model C-XT2, Simon-Day Ltd., Winnipeg, MB). The air flow was set to remove a maximum amount of chaff without removing any mustard seed. The oat was separated by the riddle, with the wheat going through the riddle and the oat going over the top, the mustard was then separated by the 5/64 round sieve, with the wheat going over the sieve and the mustard falling through. The amount of wheat falling through the 5/64 round was of a trace amount. The riddle did not remove all of the oat seed; therefore we had to estimate the remaining oat in the sample. We did this by taking a 200 g sub sample for each plot, separating the oat manually and calculating the percentage of oat in the 200g sample and applying that percentage to the whole sample. In 2005 and 2006, a vertical air flow column separator was used to separate a majority of the oat seed from the wheat in the 200g sample, prior to hand picking of the sample.

Data for the varietal study were analyzed using PROC MIXED (SAS Institute, Cary, NC; version 9.3) with weed treatment and cultivars considered fixed effects and years and replications considered random effects. The method of Cornelius et al (1992) was used to test for significant ( $P=0.05$ ) changes in genotype rank between weed-free and weedy conditions. Main effects are presented for traits in which cultivar x weed density interactions were not significant at  $P=0.05$ . Correlation coefficients were tested for homogeneity at the 0.05 probability level prior to pooling across years.

### **Elite breeding line evaluations**

Experiments designed to evaluate and select elite breeding lines from the CDC spring wheat breeding program were set up using a Randomized Complete Block Design with four replications. Seeding rate was not adjusted for germination as it was greater than 95% based on a random sub-sample tested. Seeding rate was, however, adjusted for seed weight. Herbicide applications were as for the varietal comparison experiment with the exception that the non-weedy treatments were treated with Horizon and Buctril M with Score adjuvant at recommended rates once during the growing season in 2006, 2007 and 2008.

Data from the breeding line experiments was analyzed using AGROBASE software. Separate trials with new entries were grown in each year thus the data was not combined over years. Since the purpose of these experiments was to select promising lines for competitive ability, a simplified analysis was used whereby ANOVAS were calculated and presented for weed-free and weedy treatments separately.

### **Early-generation divergent selection**

In 2004 we grew out 80  $F_4$  bulk populations and 40  $F_2$  bulk populations using the yield trial weed competition protocol. Each population was split in half and sown in a weedy and a non-weedy pair. In 2005 we again maintained the pairings and harvested 300 spikes from each competition regime of the populations in the  $F_5$  generation. Of the 79 populations sampled, 15 had two bulk plots sown per competition regime while 64 had a single plot.

The 300 spikes per plot were threshed individually and the seed selected for plumpness and 200 were planted in hills in 2006.

In 2006 we planted 400 spikes from each of the 64 populations in hills (200 selected under weedy conditions versus 200 selected under non-weedy conditions) in the  $F_6$  generation. The 200 spikes from the "weedy" treatments from 2004 and 2005 bulks were sown under weedy conditions in 2006. Likewise, the 200 spikes selected under non-weedy conditions were sown in hills under non-weedy conditions in 2006. For the 15 populations for which two bulk plots per competition regime were grown in 2004 and 2005, the total number of hills grown was 800.

Thus, in total, nearly 38,000 hills were sown for this study in 2006. The first set of 22 F<sub>6</sub> populations was harvested on a hill basis. Hills producing more than 15 spikes were selected from the weedy nursery. In theory, 15 spikes should produce about 300 seeds, which should suffice to plant a micro-plot. In the weed-free nursery hills were selected using the 15 spike criterion as well as reduced straw length and lodging.

#### **2007 Micro-plot experiment and 2008 replicated experiment:**

Thirty-one hills were selected per 200 hills and seeded in microplots in 2007. Thus, 1100 genotypes were assayed under weedy conditions and another 1100 under non-weedy conditions. In addition control cultivars AC Barrie and AC Superb were used as repeated checks in the microplot nursery.

The microplot size was 1.2 m x 1.2 m and consisted of five rows. The weed competition protocol was the same as that for the hill nursery. The seeding rate per plot was 8 to 10 grams of seed on a volume basis. The microplot nursery was sown on 16 and 17 May, 2007. The weed-free microplots were sprayed with Horizon and Buctril M with Score adjuvant at recommended rates once during the growing season.

The populations (pedigrees presented in Table 12) evaluated under weedy and weed-free conditions were split into two groups for data analysis purposes. Group 1 consisted of populations for which 62 lines were assayed under either weedy or weed-free conditions. Group 2 populations had 28-31 lines assayed (Table xx). The yield data for each of the three species (wheat, oat and mustard) were analyzed using the ANOVA GLM procedure (MINITAB v13). Applying 10-15% selection pressure, the highest yielding lines under weedy or non-weedy microplot formats were advanced for testing in a replicated, standard size plot format in 2008. The check cultivars included AC Barrie and AC Superb as well as a number of cultivars from the 2007 elite line experiment. Once again, the lines selected under weedy conditions were retested under weedy conditions and the non-weedy lines under NW (non weedy) conditions. The 180 lines were divided into two trials. Thus, there were two trials under weedy conditions and two trials under weed-free conditions. An RCBD with two replications and 3.6 m length plots was used

#### **Hill nurseries in 2007 and 2008:**

In 2006 a set of hill plots were sampled by harvesting three spikes per hill and subsequently two of the three spikes were sown as paired-hills in 2007. This resulted in a nursery with 2,320 weedy and 2,320 non-weedy hills (Table 7). This resulted in a total of approximately 4,600 hills being sown and a 10-15% selection pressure was applied. The plan was to assess the lines harvested from the 2007 paired hill plots in 2008 microplots. However, heavy wheat midge infestations in 2007 reduced seed quantities to the point that the material was grown in single 1.2 m rows spaced 30 cm apart, in 2008.

Selections from the 2007 bulk nursery were grown in an unpaired hill nursery in 2008, using the same protocol as in 2006. The nursery consisted of 11,264 hills (5,632 weedy and 5,632 NW).

## **RESULTS**

### **Wheat varietal experiment (2004 to 2006)**

Model weed densities averaged 49 mustard seedlings m<sup>-2</sup> and 56 oat seedlings m<sup>-2</sup>. The wheat densities averaged 250 seedlings m<sup>-2</sup> over the three years.

A significant cultivar x weed interaction for wheat yield (Table 1) was observed. Wheat and barley grain yields were reduced, on average, by 42% over the course of three years (Table 2). As was observed in earlier experiments (Hucl et al, 1997) the two row barley cultivar suffered the smallest yield reduction (23%). The University of Saskatchewan experimental bread wheat line PT559 and the heritage cultivar Red Fife suffered the smallest yield reductions under competition but were among the lowest for yield under non-weedy conditions (Table 2). The least competitive CWRS wheat cultivars in this experiment were Journey, AC Abbey and 5601HR. The CPS wheat cultivars were poor competitors. AC Crystal and AC Foremost experienced yield reductions of 56 and 54%, respectively. The semi dwarf durum cultivar Navigator was also amongst the poorest competitors. The cereal cultivars differed significantly ( $P=0.05$ ) in terms of agronomic traits and in the amount of mustard and oat grain produced in their presence. Wheat cultivars switched rank for grain yield between the non-weedy and weedy treatments, and some of these changes in rank were statistically significant. Of the eight significant pair-wise changes in cultivar rank, 39 involved CPS cultivars and 32 involved CWAD cultivars. The CWAD cultivar, Navigator accounted for 23 of the 86 rank changes. A majority of the rank switches between the non-weedy and weedy treatments were between the CWRS and either the CPS or CWAD market classes. Of the 46 wheat cultivars, only the CWES cultivar 'CDC Rama' was in the top quartile for yield under both non-weedy and weedy conditions. The CWRS cultivars 'Lovitt' and 'CDC Go', the CWES cultivar 'CDC Walrus' and the spring spelt cultivar 'CDC Zorba' were intermediate for yield potential and competitive ability. CDC Zorba allowed the least oat grain production and did not differ significantly from the two row barley cultivar CDC Kendall. The CWES cultivars CDC Rama and CDC Walrus, the CWRS cultivars AC Intrepid, Prodigy, 5600HR and PT559 did not differ significantly from the barley control in terms of oat grain yield (Table 2).

Wheat grain yield reduction was positively correlated with oat and mustard seed yield (Table 3). Crop height, was negatively correlated ( $P<0.01$ ) with wheat yield reduction. Days to spike emergence and maturity were weakly or not correlated with wheat yield reduction.

### Elite breeding line evaluations

In the 2004 evaluation of elite CDC breeding lines (Tables 4 and 5) we observed yield reductions ranging from a low of 18% to a high of 58% (2004 Experiment#1) and a low of 18% to a high of 51% (2004 Experiment#2).

In the 2005 evaluation of elite CDC breeding lines (2004 Experiments#1 and #2) we observed yield reductions ranging from a low of 38% to a high of 62% (Table 6) and a low of 26% to a high of 48% (Table 7). CDC Merlin and Marquis were considered the competitive controls in these experiments. Marquis ranked first for competitive ability but last for non-weedy grain yield in Experiment#1 (Table 6). CDC Merlin ranked 22<sup>nd</sup> and 59<sup>th</sup> for the two traits. Eighteen of the entries in Experiment# 1 (**bolded and underlined** treatment ID's) were selections from the trials conducted in 2004. The remaining entries were new lines first yield-tested in multi-location trials in 2005. Of the 18 experimental lines re-tested in 2005, fourteen performed equal to or better than AC Barrie for yield potential and competitive ability. That is, nearly 80% of the lines we selected in 2004 performed well in 2005. Of the lines tested for the first time in 2005, seven warranted retesting in 2006 (Table 6). The correlation between plant height and yield reduction was weak ( $r=-0.26$ ) in this data set, indicating that other growth factors accounted for genotypic differences in competitive ability. This is not surprising since very few semi dwarf lines were included in this experiment. Of the 47 lines tested in Experiment#2 (Table 7), eight warranted retesting in 2006 based on their competitive ability and yield potential (trts 20, 25, 26, 27, 34, 27, 47&54). Marquis ranked first for competitive ability while CDC Merlin ranked 39<sup>th</sup> in this particular trial (Table 7).

The results of Experiments 1 and 2 in 2006 are reported in Tables 8 and 9, respectively. The grain yield reductions among wheat lines ranged from 34 to 57% (Experiment#1) and 27 to 45% Experiment#2). AC Barrie and CDC Merlin tended to be the most competitive check cultivars.

Wheat yield reductions were not correlated with plant height while days to heading and maturity were weakly correlated with competitive ability. Oat and mustard yields were correlated with wheat yield reduction in Exp.#1( $r= 0.55$  and  $0.48$ ). In Exp.#2 oat yields were not correlated with wheat yield reduction ( $r=0.07$ ) while mustard yields were ( $r=0.55$ ).

Based on the results from the 2006 experiments, 20 out of 100 experimental lines were advanced for further testing in 2007. Of the 20 lines advanced for further testing, ten were lines identified as being more competitive in trials conducted prior to 2006.

In 2007, we evaluated 54 experimental lines and 10 control cultivars (Table 10). Of the 54 lines, three had been evaluated since 2004, seven since 2005 and 10 since 2006. Grain yield reductions ranged from 27 to 47%. Of the control cultivars CDC Go and AC Superb exhibited the highest yield potential (NW conditions) and smallest yield reductions in the presence of model weeds.

in 2008, 26 experimental lines and 10 control cultivars (same as in 2007) were evaluated (Table 11). Of the 26 experimental lines, 15 had been evaluated two years or more. Grain yield reductions ranged from 36 to 60%. Of the control cultivars, Red Fife and AC Superb had the highest yield potential and smaller yield reductions when challenged with model weeds.

Over the five years of this project 274 breeding lines were evaluated at least once. Of these 274 lines, five were entered in pre-registration ('B'-level tests) trials and two of those were advanced to the cultivar registration testing level. Both lines were first evaluated as part of this project in 2004. W03399 (Table 4) was tested as BW397 in the Central Bread Wheat Cooperative Test in 2006 and 2007. BW397 was dropped from further testing as it did not yield as well as some of the check cultivars in the registration Test. The second line, W03602 (Table 5), was tested as BW881 in the Western Bread Wheat Cooperative Test from 2006 to 2008 and could potentially be brought forward for Support of Registration in early 2009. Both lines were evaluated for three years in this project (2004 to 2006) indicating that they had a good NW yield potential/low yield reduction profile compared to AC Barrie and other check cultivars.

#### **Evaluation of lines from segregating populations**

The GLM ANOVA procedure detected highly significant ( $P=0.000$ ) differences in yield among the populations for wheat as well as the model weeds grown in a micro plot format in 2007. Population X02.218 was the least competitive while X02.244 was the most competitive in Group 1 (Table 13). The Group 2 populations appeared to be less competitive as a whole. Mustard yield was negatively correlated with wheat yield ( $r=-0.44^{***}$ ) but oat yield was not ( $r=-0.22$ ).

The wheat yields were subjected to a combined (weedy vs weed-free) GLM ANOVA procedure. The ANOVA detected highly significant ( $P=0.000$ ) weed regime x wheat population interactions for both Group 1 and Group 2 populations (Table 13). The interaction was not a result of cultivar x treatment cross-overs so much as differential increases in yield in the absence of competition from the model weeds. The Group 1 population that was highest yielding under competition was the highest yielding under weed-free conditions (Table 13). However, that was not the case for Group 2. On average, wheat yields were twice as high under weed-free conditions.

A selection pressure of approximately 15% (10/62 or 5/31) was used to select lines grown from each weed regime in 2007 for evaluation in 2008. Wheat grain yield was used as the selection criterion as it was highly correlated ( $r=0.92^{**}$ ) with apparent weed suppression. Thus a total of 180 lines were grown under weedy conditions in 2008 while another 180 lines were grown under weed-free conditions (Tables 14 and 15). The cultivars AC Barrie and AC Superb were included as controls in addition to four other cultivars selected from the initial varietal evaluation experiment. In both experiments conducted in 2008 (Tables 14 and 15) the wheat population x weed regime interactions was statistically non-significant. This was in contrast to the results from the 2007 unreplicated experiments. This lack of interaction could be attributed to the fact the

highest yielding lines had been selected in either weed regime/selection stream for each population. As a result, the yield spread between NW and weedy treatments was relatively narrow (40 to 47%, mean 43%) for the set of nine breeding populations while the spread for the control cultivars was from 30 to 49% (Table 14). For the second set of 13 populations (Table 15), the yield differential ranged from 27 to 44% with a mean of 35% and may reflect the fact most of the populations in this grouping were lower yielding for either weed regime in 2007, resulting in a smaller differential. The control cultivars experienced yield reductions ranging from 20 to 55% with a mean similar to that of the control set for the first group of populations (Table 14).

Lines from 57 populations from the second cycle of divergent selection were evaluated in single row plots in 2008 (Table 16). As was the case with the 2007 microplot nursery, statistically significant ( $P=0.001$ ) wheat population x weed regime interactions were detected. The average yield differential between lines grown under NW versus weedy conditions was 43.5%, similar to the mean of the control cultivars (40%). The intra-population differential ranged from 9.6% (population X02.106) to 65.5% (population X02.105). The yield differential tended to be smaller in populations with an apparent smaller yield potential. Approximately 15 populations produced higher yields than the check cultivars under both NW and weedy conditions (Table 16).

### **Conclusions and Recommendations**

In the present project, spring wheat cultivars differed significantly in their ability to maintain yield in the presence of competing species and to reduce oat and mustard grain yield. Furthermore, significant crossover interactions (changes in cultivar rank) for wheat grain yield under weed-free versus weedy conditions were detected. Thus, a cultivar's grain yield under weed-free conditions was not necessarily a good predictor of crop yield reduction due to inter-specific competition. Of the wheat traits measured, crop height appeared to have the greatest impact on competitive ability. The shortest wheat genotypes tended to suffer the largest yield reductions and allowed the most weed growth. This is in agreement with earlier reports in the literature (Mason and Spaner, 2006).

Semi dwarf cultivars in the CPS class tended to suffer the highest yield reductions due to model weed pressure and allowed higher model weed grain yields. These observations are consistent with those of Kirkland and Hunter (1991) who concluded that high yielding semi dwarf cultivars of wheat are more susceptible to yield losses due to weed interference than standard height cultivars.

On average, less than 5% of the wheat cultivars evaluated were in the top quartile for grain yield under both weed-free and weedy conditions. The CWES cultivars Glenlea and CDC Rama were the only ones that combined high yield potential with higher competitive ability. These cultivars have larger seeds and are taller. The larger seed may provide a competitive advantage earlier in crop development and the taller plant stature may benefit these cultivars later in the season. The wheat cultivars that experienced the

smallest yield reductions due to competition from model weeds (Roblin, CDC Merlin, Park, Marquis, PT559, and Red Fife) were amongst the lowest yielding in the absence of weeds. Thus, the smaller yield reductions experienced by these cultivars were, in part, an artifact of their lower yield potential and inability to respond to higher environmental resources.

A number of cultivars with intermediate to higher yield potential with high to intermediate yield maintenance ability were identified. The CWRS cultivars Lovitt, CDC Go and the spelt cultivar Zorba fit in that category. With the exception of CDC Go these cultivars are intermediate to tall for plant height. CDC Go appears to be an outlier in that it was one of the shortest-strawed cultivars in the experiment in which it was evaluated yet was effective in maintaining grain yield and suppressing model weed grain yield. Under weed-free conditions CDC Go yielded 15% higher than AC Abbey, another semidwarf CWRS cultivar, but 40% higher under model weed pressure. These results suggest that CDC Go has a growth habit that differs from other short-strawed cultivars, allowing it to better maintain its grain yield under model weed pressure.

Although a small minority, cultivars exhibiting the desired combination of high yield potential and ability to limit weed growth were identified. These outlier cultivars differences could be exploited in situations where alternate or reduced-herbicide weed control strategies are desired.

During the course this project 274 advanced generation bread wheat breeding lines from the CDC were evaluated at least once. Of these 274 lines, two of were advanced to the cultivar registration testing level. One of these lines, W03602, was tested as BW881 in the Western Bread Wheat Cooperative Test from 2006 to 2008 and could potentially be brought forward for Support of Registration in early 2009. Thus, cultivars and breeding lines selected in the absence of weed pressure tend to provide little scope for selecting more competitive cultivars that might be of use in organic production systems.

The final part of this project involved applying a divergent selection scheme to a range of populations in order to develop breeding lines under either non-weedy or weedy conditions. In the final year of the project the first set of selected lines were evaluated in replicated trials. This material will now be available to test under conventional and organic conditions in order to assess whether selection under a model weed scenario will result in lines better suited to organic production.

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## **Administrative and other aspects**

### **Personnel:**

M. Grieman (July 1, 2004 – November 30, 2004) -50%  
(January 1, 2005 – January 31, 2006) -60%  
(February 1, 2006 – April 30, 2008) -50%  
(May 1, 2008 – January 31, 2009) -40%  
(Technician)

L. Roth (May 1, 2005 – August 31, 2005) – 100%  
(Summer Assistant)

S. Campbell (November 1, 2005 – January 31, 2006) – 100%  
(Technical Assistant)

M. Lambert (May 1, 2006 – August 31, 2006) – 100%  
(Summer Assistant)

Numa (September 1, 2006 – April 30, 2007) – 100%  
(Technical Assistant)

J. Zdunich (October 1, 2006 – December 31, 2006) – 100%  
(Technical Assistant)

E. Bertholet (July 4, 2007 – August 30, 2007) – 100%  
(Summer Assistant)

F. Gonzalez (September 1, 2007 – March 31, 2008) – 100%  
(April 1, 2008 – January 31, 2009) – 50%  
(Technician)

T. McJannet (September 1, 2008 to January 31, 2009) – 100%  
(Technical Assistant)

M. Ismaeel (November 1, 2008 to January 31, 2009) – 100%  
(Technical Assistant)

L. Pizzaro (December 1, 2008 to January 31, 2009) – 100%  
(Technical Assistant)

### **Other contributors:**

P. Hucl (April 1, 2004 – February 16, 2009)-2%

K. Jackle (April 1, 2004 – March 31, 2008)-10%  
(Technician)

Four casual staff (November 1 to December 31, 2004) – 50%

**Table 1. Analyses of variance for wheat yield, wheat agronomic traits and weed grain yield for the wheat varietal study**

| Fixed effects sources      | Mean square                       |         |     |
|----------------------------|-----------------------------------|---------|-----|
|                            | Grain yield ( $\text{g m}^{-2}$ ) |         |     |
|                            | df                                | F value |     |
| Cultivar                   | 47                                | 7.7     | *** |
| Weed management            | 1                                 | 73      | *   |
| Cultivar x weed management | 47                                | 7.9     | *** |

**Cultivar effect:**

|                     | df | Mean square |     |
|---------------------|----|-------------|-----|
| DSE <sup>‡</sup>    | 47 | 6.47        | *** |
| DPM <sup>‡</sup>    | 47 | 11.83       | *** |
| Plant height        | 47 | 32.33       | *** |
| Oat grain yield     | 47 | 4.20        | *** |
| Mustard grain yield | 47 | 9.04        | *** |

\*\*\* Significant at  $P=0.05$  and  $P=0.001$ , respectively.

<sup>‡</sup> DSE, days to spike emergence; DPM, days to physiological maturity.

**Table 2. Least square means for grain yield and agronomic traits of 46 wheat, one triticale and one barley cultivar, and their effect on mustard and oat grain yield, averaged over three years (2004-2006).**

| Cultivar    | Market | Wheat grain yield |       |           |                  |                  | Plant  | Mustard           | Oat |
|-------------|--------|-------------------|-------|-----------|------------------|------------------|--------|-------------------|-----|
|             | class  | control           | weedy | reduction | DSE <sup>†</sup> | DPM <sup>†</sup> | height | grain yield       |     |
|             |        | g m <sup>-2</sup> |       | %         | d                | d                | cm     | g m <sup>-2</sup> |     |
| AC Barrie   | CWRS   | 395               | 229   | 42.0      | 55               | 94               | 94     | 59                | 121 |
| CDC Bounty  | CWRS   | 420               | 254   | 39.4      | 54               | 100              | 97     | 44                | 105 |
| AC Cadillac | CWRS   | 399               | 253   | 36.7      | 54               | 98               | 97     | 49                | 101 |
| AC Elsa     | CWRS   | 400               | 210   | 47.5      | 54               | 91               | 91     | 60                | 118 |
| Harvest     | CWRS   | 386               | 236   | 38.8      | 52               | 89               | 88     | 54                | 116 |
| CDC Imagine | CWRS   | 423               | 243   | 42.7      | 55               | 92               | 97     | 51                | 115 |
| AC Intrepid | CWRS   | 387               | 240   | 38.1      | 52               | 90               | 90     | 41                | 99  |
| Journey     | CWRS   | 403               | 205   | 49.2      | 56               | 93               | 94     | 55                | 134 |
| AC Abbey    | CWRS   | 367               | 188   | 48.7      | 54               | 85               | 86     | 68                | 134 |
| Eatonia     | CWRS   | 351               | 204   | 41.9      | 55               | 98               | 98     | 54                | 117 |
| Lillian     | CWRS   | 410               | 238   | 41.8      | 56               | 93               | 92     | 55                | 109 |
| Lovitt      | CWRS   | 427               | 273   | 36.1      | 54               | 97               | 93     | 42                | 105 |
| McKenzie    | CWRS   | 425               | 237   | 44.4      | 52               | 96               | 94     | 52                | 122 |
| Prodigy     | CWRS   | 414               | 254   | 38.7      | 55               | 97               | 95     | 48                | 94  |
| AC Splendor | CWRS   | 368               | 215   | 41.7      | 52               | 94               | 94     | 44                | 110 |
| AC Superb   | CWRS   | 407               | 245   | 39.8      | 53               | 86               | 90     | 49                | 112 |
| CDC Teal    | CWRS   | 403               | 244   | 39.3      | 54               | 93               | 92     | 47                | 107 |
| 5500HR      | CWRS   | 391               | 223   | 42.9      | 54               | 93               | 92     | 56                | 127 |
| 5600HR      | CWRS   | 402               | 242   | 39.9      | 55               | 100              | 98     | 47                | 99  |
| 5601HR      | CWRS   | 368               | 189   | 48.7      | 56               | 100              | 98     | 63                | 121 |
| Roblin      | CWRS   | 343               | 207   | 39.5      | 51               | 87               | 89     | 45                | 109 |
| Katepwa     | CWRS   | 377               | 217   | 42.3      | 54               | 98               | 97     | 54                | 121 |
| Marquis     | CWRS   | 320               | 210   | 34.3      | 58               | 106              | 105    | 49                | 103 |
| Red Fife    | CWRS   | 364               | 255   | 30.0      | 58               | 114              | 111    | 41                | 100 |
| CDC Merlin  | CWRS   | 364               | 242   | 33.6      | 54               | 99               | 100    | 42                | 107 |
| CDC Osler   | CWRS   | 413               | 226   | 45.2      | 54               | 92               | 93     | 53                | 122 |
| CDC Go      | CWRS   | 424               | 264   | 37.6      | 51               | 80               | 81     | 39                | 107 |
| CDC Alsask  | CWRS   | 411               | 258   | 37.3      | 54               | 94               | 93     | 46                | 106 |
| PT 559      | CWRS   | 343               | 246   | 28.3      | 52               | 93               | 94     | 36                | 97  |
| Snowbird    | CWHW   | 382               | 223   | 41.6      | 53               | 92               | 90     | 54                | 119 |
| AC Crystal  | CPS    | 402               | 178   | 55.8      | 59               | 84               | 85     | 74                | 143 |
| AC Foremost | CPS    | 457               | 209   | 54.3      | 55               | 76               | 79     | 75                | 152 |
| AC Taber    | CPS    | 445               | 224   | 49.7      | 58               | 84               | 85     | 59                | 136 |
| 5700PR      | CPS    | 422               | 202   | 52.0      | 54               | 78               | 79     | 61                | 151 |
| 5701PR      | CPS    | 429               | 240   | 44.2      | 55               | 78               | 79     | 64                | 134 |
| AC Vista    | CPS    | 481               | 265   | 44.9      | 53               | 83               | 85     | 47                | 119 |
| AC Andrew   | CWSWS  | 540               | 298   | 44.8      | 56               | 84               | 83     | 55                | 123 |

|              |           |                  |                  |      |    |     |     |    |     |
|--------------|-----------|------------------|------------------|------|----|-----|-----|----|-----|
| Glenlea      | CWES      | 387              | 241              | 37.7 | 57 | 103 | 100 | 50 | 105 |
| CDC Rama     | CWES      | 435              | 286              | 34.3 | 54 | 103 | 101 | 37 | 91  |
| CDC Walrus   | CWES      | 427              | 266              | 37.6 | 56 | 97  | 97  | 46 | 99  |
| Kyle         | CWAD      | 445              | 239              | 46.4 | 57 | 108 | 107 | 48 | 118 |
| AC Avonlea   | CWAD      | 447              | 226              | 49.5 | 53 | 90  | 89  | 55 | 108 |
| AC Morse     | CWAD      | 470              | 242              | 48.4 | 53 | 86  | 87  | 54 | 126 |
| Napoleon     | CWAD      | 483              | 258              | 46.5 | 55 | 93  | 91  | 53 | 102 |
| AC Navigator | CWAD      | 472              | 211              | 55.2 | 55 | 81  | 82  | 63 | 145 |
| CDC Zorba    | Spelt     | 431              | 267              | 38.0 | 61 | 119 | 115 | 37 | 86  |
| Sandro       | Trtitcale | 548              | 314              | 42.7 | 54 | 99  | 99  | 51 | 144 |
| CDC Kendall  | Barley    | 477              | 370              | 22.5 | 58 | 71  | 72  | 23 | 81  |
| Average      |           | 414              | 240              | 41.9 | 55 | 93  | 92  | 51 | 115 |
| LSD(0.05)    |           | 41w <sup>†</sup> | 68b <sup>‡</sup> |      | 3  | 4   | 5   | 9  | 23  |

<sup>†</sup> DSE, days to spike emergence; DPM, days to physiological maturity.

<sup>‡</sup> w, within column comparisons; b, between column comparisons.

**Table 3. Correlation of percent wheat grain yield reduction with wheat agronomic traits and weed grain yields (2004-2006).**

|                         | <b>r</b> |    |
|-------------------------|----------|----|
| Weedy wheat grain yield |          |    |
| DSE <sup>‡</sup>        | 0.12     | NS |
| DPM <sup>‡</sup>        | 0.39     | ** |
| Plant height            | -0.54    | ** |
| Oat grain yield         | 0.77     | ** |
| Mustard grain yield     | 0.75     | ** |

\* Significant at P=0.01; <sup>‡</sup>NS, not significant

Table 4. 2004 Evaluation of CDC elite bread wheat lines for competitive ability - Experiment#1

| ENTRY | NAME        | Pedigree                    | NW<br>wheat<br>yield |     | Weedy<br>wheat<br>yield |      | %  | Rnk | Oat<br>yield | Must<br>yield | DSE   | DPM   | Ht |
|-------|-------------|-----------------------------|----------------------|-----|-------------------------|------|----|-----|--------------|---------------|-------|-------|----|
|       |             |                             | g m <sup>-2</sup>    | Rnk | g m <sup>-2</sup>       | redn |    |     |              |               |       |       |    |
| 1     | AC Barrie   |                             | 483                  | 6   | 308                     | 36.3 | 32 | 208 | 32           | 56.5          | 114.1 | 95.6  |    |
| 2     | Superb      |                             | 454                  | 21  | 330                     | 27.3 | 10 | 187 | 28           | 55.9          | 116.2 | 89.0  |    |
| 3     | Elsa        |                             | 485                  | 5   | 302                     | 37.7 | 40 | 186 | 41           | 56.1          | 110.6 | 92.0  |    |
| 4     | AC Splendor |                             | 439                  | 36  | 263                     | 40.2 | 51 | 196 | 45           | 53.1          | 104.5 | 95.5  |    |
| 5     | W03171      | ND694/P99.51#6              | 410                  | 55  | 246                     | 39.9 | 50 | 206 | 42           | 56.9          | 111.1 | 98.0  |    |
| 6     | W03175      | ND694/P99.51#6              | 473                  | 11  | 318                     | 32.8 | 23 | 210 | 47           | 56.1          | 111.5 | 88.8  |    |
| 7     | W03176      | ND694/P99.51#6              | 459                  | 14  | 312                     | 32.1 | 18 | 194 | 36           | 55.5          | 107.4 | 92.6  |    |
| 8     | W03179      | ND694/P99.51#6              | 430                  | 44  | 300                     | 30.2 | 13 | 173 | 34           | 54.5          | 107.7 | 95.0  |    |
| 9     | W03182      | ND694/P99.51#6              | 439                  | 37  | 297                     | 32.5 | 21 | 154 | 31           | 54.3          | 104.2 | 94.8  |    |
| 10    | W03189      | Teal/FHB9                   | 440                  | 34  | 322                     | 26.8 | 7  | 163 | 40           | 57.3          | 114.7 | 104.4 |    |
| 11    | W03209      | Teal/FHB9                   | 439                  | 35  | 351                     | 20.1 | 2  | 158 | 30           | 56.2          | 107.9 | 99.5  |    |
| 12    | W03213      | Teal/FHB9                   | 487                  | 4   | 334                     | 31.5 | 17 | 181 | 28           | 56.5          | 110.1 | 94.4  |    |
| 13    | W03214      | Teal/FHB9                   | 449                  | 24  | 305                     | 32.2 | 20 | 155 | 30           | 58.5          | 115.1 | 100.1 |    |
| 14    | W03255      | BW781/99FHB359              | 358                  | 63  | 192                     | 46.3 | 60 | 240 | 34           | 54.8          | 112.3 | 91.2  |    |
| 15    | W03314      | BW275//HW00009/99FHB359(W)  | 435                  | 39  | 329                     | 24.5 | 5  | 167 | 27           | 55.8          | 112.3 | 102.3 |    |
| 16    | W03317      | BW275//HW00009/99FHB359(Rd) | 446                  | 26  | 342                     | 23.4 | 4  | 154 | 20           | 59.6          | 118.4 | 102.0 |    |
| 17    | W03320      | BW275//HW00009/99FHB359(Rd) | 434                  | 43  | 303                     | 30.3 | 14 | 198 | 31           | 58.9          | 116.6 | 107.1 |    |
| 18    | W03328      | BW275//HW00009/99FHB359(Rd) | 497                  | 1   | 299                     | 39.8 | 47 | 180 | 36           | 56.5          | 114.0 | 101.4 |    |
| 19    | W03329      | BW275//HW00009/99FHB359(Rd) | 344                  | 64  | 185                     | 46.3 | 61 | 257 | 58           | 59.8          | 118.4 | 87.5  |    |
| 20    | W03355      | BW316/P00.06-72             | 457                  | 17  | 333                     | 27.2 | 9  | 183 | 27           | 56.0          | 115.7 | 113.0 |    |
| 21    | W03361      | BW316/P00.06-72             | 453                  | 22  | 284                     | 37.3 | 39 | 199 | 30           | 56.6          | 114.1 | 107.6 |    |
| 22    | W03365      | BW316/P00.06-72             | 400                  | 58  | 241                     | 39.8 | 48 | 172 | 37           | 56.9          | 118.1 | 100.9 |    |
| 23    | W03384      | BW316/P00.06-72             | 456                  | 18  | 191                     | 58.1 | 64 | 199 | 34           | 58.3          | 116.9 | 93.5  |    |
| 24    | W03386      | BW316/P00.06-77             | 435                  | 42  | 309                     | 28.8 | 11 | 162 | 20           | 55.8          | 114.8 | 104.9 |    |
| 25    | W03387      | BW316/P00.06-77             | 441                  | 32  | 267                     | 39.4 | 46 | 255 | 35           | 55.4          | 118.7 | 81.3  |    |
| 26    | W03397      | BW316/P00.06-77             | 426                  | 45  | 261                     | 38.8 | 43 | 214 | 40           | 56.1          | 119.6 | 84.8  |    |
| 27    | W03399      | BW316/P00.06-77             | 445                  | 28  | 347                     | 22.0 | 3  | 141 | 20           | 56.3          | 116.4 | 103.3 |    |
| 28    | W03412      | BW316/P00.38-9              | 449                  | 25  | 276                     | 38.5 | 41 | 181 | 44           | 55.7          | 115.2 | 93.9  |    |
| 29    | W03421      | BW316/P00.38-38             | 391                  | 59  | 249                     | 36.4 | 33 | 191 | 29           | 55.9          | 110.7 | 95.6  |    |
| 30    | W03422      | BW316/P00.38-38             | 476                  | 10  | 259                     | 45.5 | 58 | 246 | 33           | 56.4          | 115.6 | 81.4  |    |
| 31    | W03428      | Teal/ND2710//Teal//MN9341   | 444                  | 30  | 306                     | 31.1 | 16 | 177 | 37           | 55.5          | 111.6 | 97.4  |    |
| 32    | W03545      | BW251/BW279                 | 454                  | 19  | 296                     | 34.9 | 30 | 237 | 40           | 56.1          | 118.7 | 94.3  |    |

|    |         |               |     |    |      |      |    |      |    |      |       |       |
|----|---------|---------------|-----|----|------|------|----|------|----|------|-------|-------|
| 33 | W03584  | BW720/FHB2    | 458 | 16 | 299  | 34.8 | 28 | 174  | 25 | 56.7 | 110.1 | 90.6  |
| 34 | W03590  | BW720/FHB2    | 424 | 47 | 281  | 33.6 | 25 | 195  | 31 | 54.0 | 108.8 | 87.0  |
| 35 | W03608  | BW720/FHB4    | 425 | 46 | 288  | 32.2 | 19 | 156  | 30 | 54.5 | 109.5 | 88.5  |
| 36 | W03610  | BW720/FHB4    | 483 | 7  | 315  | 34.7 | 27 | 179  | 26 | 58.1 | 117.6 | 102.8 |
| 37 | W03620  | BW720/FHB8    | 459 | 15 | 297  | 35.3 | 31 | 164  | 31 | 57.0 | 114.6 | 97.4  |
| 38 | W03623  | BW720/FHB8    | 417 | 52 | 250  | 40.2 | 52 | 227  | 39 | 54.5 | 112.8 | 91.0  |
| 39 | W03650  | TEAL/FHB1     | 410 | 56 | 285  | 30.4 | 15 | 204  | 32 | 56.7 | 110.0 | 96.4  |
| 40 | W03653  | TEAL/FHB1     | 446 | 27 | 281  | 37.0 | 36 | 175  | 25 | 55.8 | 111.0 | 95.9  |
| 41 | W03657  | TEAL/FHB1     | 375 | 62 | 274  | 26.8 | 8  | 156  | 23 | 56.4 | 110.6 | 95.6  |
| 42 | W03662  | TEAL/FHB7     | 479 | 9  | 302  | 36.8 | 35 | 154  | 29 | 56.2 | 109.1 | 98.6  |
| 43 | W03667  | TEAL/FHB7     | 423 | 48 | 275  | 34.9 | 29 | 193  | 37 | 56.8 | 109.6 | 90.9  |
| 44 | W03675  | TEAL/FHB2     | 417 | 53 | 295  | 29.4 | 12 | 156  | 30 | 56.3 | 111.3 | 100.5 |
| 45 | W03678  | TEAL/FHB2     | 440 | 33 | 297  | 32.5 | 22 | 169  | 22 | 56.5 | 110.4 | 93.8  |
| 46 | W03682  | TEAL/FHB2     | 442 | 31 | 271  | 38.7 | 42 | 202  | 28 | 55.8 | 111.5 | 89.0  |
| 47 | W03686  | TEAL/FHB2     | 453 | 23 | 284  | 37.2 | 37 | 215  | 27 | 55.5 | 112.1 | 87.8  |
| 48 | W03732  | TEAL/FHB9     | 389 | 60 | 287  | 26.4 | 6  | 182  | 29 | 55.5 | 109.7 | 91.1  |
| 49 | W03736  | TEAL/FHB9     | 494 | 2  | 268  | 45.9 | 59 | 257  | 43 | 55.8 | 111.0 | 95.4  |
| 50 | W03759  | BW720*2/BW278 | 418 | 51 | 343  | 17.8 | 1  | 123  | 28 | 59.1 | 114.1 | 107.3 |
| 51 | W03763  | BW720*2/BW278 | 413 | 54 | 241  | 41.5 | 56 | 198  | 39 | 58.1 | 108.4 | 104.2 |
| 52 | W03764  | BW720*2/BW278 | 435 | 40 | 266  | 38.8 | 44 | 194  | 42 | 58.0 | 110.4 | 102.7 |
| 53 | W03767  | BW720*2/BW278 | 435 | 41 | 276  | 36.6 | 34 | 227  | 41 | 58.8 | 111.7 | 103.1 |
| 54 | W03768  | BW720*2/BW278 | 481 | 8  | 231  | 52.0 | 63 | 196  | 35 | 58.7 | 113.4 | 91.1  |
| 55 | W03775  | BW720*2/BW278 | 407 | 57 | 241  | 40.8 | 53 | 192  | 44 | 58.7 | 115.1 | 102.5 |
| 56 | W03777  | BW720*2/BW278 | 454 | 20 | 268  | 40.9 | 55 | 199  | 48 | 59.0 | 117.8 | 102.3 |
| 57 | W03778  | BW720*2/BW278 | 445 | 29 | 292  | 34.4 | 26 | 204  | 37 | 59.1 | 116.0 | 96.7  |
| 58 | W03781  | BW720*2/BW278 | 465 | 12 | 279  | 39.9 | 49 | 201  | 49 | 56.3 | 110.0 | 95.5  |
| 59 | W03785  | BW720*2/BW278 | 387 | 61 | 259  | 33.1 | 24 | 201  | 37 | 58.9 | 117.4 | 108.5 |
| 60 | W03788  | BW720*2/BW278 | 423 | 49 | 204  | 51.7 | 62 | 239  | 60 | 58.9 | 114.9 | 100.3 |
| 61 | W03789  | BW720*2/BW278 | 462 | 13 | 290  | 37.3 | 38 | 198  | 28 | 57.1 | 108.4 | 96.0  |
| 62 | W03791  | BW720*2/BW278 | 419 | 50 | 248  | 40.9 | 54 | 227  | 44 | 58.0 | 117.2 | 102.9 |
| 63 | W03796  | BW751/FHB5    | 438 | 38 | 266  | 39.3 | 45 | 193  | 49 | 57.8 | 111.8 | 99.6  |
| 64 | W03806  | BW751/FHB5    | 489 | 3  | 278  | 43.1 | 57 | 126  | 39 | 61.1 | 117.0 | 109.3 |
|    | Average |               | 440 |    | 283  | 35.7 |    | 191  | 35 | 56.8 | 112.9 | 96.8  |
|    | CV      |               | 9.4 |    | 10.3 |      |    | 21.4 |    | 0.87 | 2.39  | 3.50  |
|    | LSD     |               | 51  |    | 36   |      |    | 48   | 11 | 0.6  | 5.0   | 5.8   |
|    | REPS    |               | 4   |    | 4    |      |    | 4    | 4  | 4    | 2     | 2     |

Table 5. 2004 Evaluation of CDC elite bread wheat lines for competitive ability - Experiment#2

| ENTRY | NAME        | Pedigree                | NW<br>wheat<br>yield |     | Weedy<br>wheat<br>yield |      | %   | Oat<br>yield      | Must<br>yield     | DSE  | DPM   | Ht    |
|-------|-------------|-------------------------|----------------------|-----|-------------------------|------|-----|-------------------|-------------------|------|-------|-------|
|       |             |                         | g m <sup>-2</sup>    | Rnk | g m <sup>-2</sup>       | redn | Rnk | g m <sup>-2</sup> | g m <sup>-2</sup> | days | days  | cm    |
| 1     | AC Barrie   |                         | 444                  | 18  | 311                     | 30.0 | 14  | 196               | 39                | 56.0 | 110.5 | 92.5  |
| 2     | AC Elsa     |                         | 430                  | 25  | 327                     | 24.0 | 4   | 166               | 69                | 56.5 | 109.0 | 90.5  |
| 3     | AC Superb   |                         | 448                  | 16  | 286                     | 36.2 | 27  | 187               | 40                | 55.0 | 111.5 | 88.5  |
| 4     | AC Splendor |                         | 412                  | 31  | 271                     | 34.3 | 24  | 184               | 53                | 53.0 | 101.0 | 95.5  |
| 5     | W03194      | Tea/FHB9                | 428                  | 26  | 345                     | 19.4 | 2   | 132               | 36                | 56.5 | 104.0 | 100.5 |
| 6     | W03205      | Tea/FHB9                | 451                  | 13  | 313                     | 30.7 | 15  | 160               | 23                | 57.0 | 110.5 | 96.5  |
| 7     | W03206      | Tea/FHB9                | 434                  | 22  | 304                     | 29.9 | 13  | 160               | 59                | 56.5 | 109.0 | 98.5  |
| 8     | W03211      | Tea/FHB9                | 445                  | 17  | 328                     | 26.3 | 9   | 160               | 27                | 57.5 | 111.0 | 98.5  |
| 9     | W03215      | Tea/FHB9                | 459                  | 9   | 347                     | 24.4 | 5   | 145               | 45                | 57.5 | 111.5 | 94.5  |
| 10    | W03226      | BW205/BW252             | 467                  | 7   | 316                     | 32.4 | 19  | 173               | 45                | 53.0 | 110.0 | 83.0  |
| 11    | W03228      | BW205/BW252             | 514                  | 2   | 274                     | 46.6 | 34  | 191               | 60                | 55.0 | 111.0 | 100.5 |
| 12    | W03231      | BW205/BW252             | 432                  | 23  | 291                     | 32.6 | 20  | 133               | 27                | 56.5 | 108.5 | 103.0 |
| 13    | W03233      | BW205/BW220             | 505                  | 3   | 338                     | 33.1 | 21  | 135               | 46                | 58.0 | 114.5 | 101.0 |
| 14    | W03234      | BW205/BW220             | 452                  | 12  | 340                     | 24.8 | 6   | 128               | 41                | 57.5 | 111.5 | 97.0  |
| 15    | W03235      | BW205/BW220             | 476                  | 6   | 313                     | 34.2 | 23  | 185               | 51                | 56.0 | 108.5 | 99.0  |
| 16    | W03236      | BW205/BW220             | 454                  | 11  | 334                     | 26.4 | 10  | 136               | 27                | 55.5 | 111.0 | 98.0  |
| 17    | W03237      | BW205/BW220             | 443                  | 20  | 362                     | 18.3 | 1   | 123               | 32                | 58.0 | 112.0 | 101.5 |
| 18    | W03239      | BW205/BW220             | 407                  | 34  | 314                     | 22.9 | 3   | 130               | 43                | 57.0 | 114.0 | 97.5  |
| 19    | W03243      | BW205/BW685             | 460                  | 8   | 317                     | 31.1 | 16  | 163               | 38                | 57.0 | 111.5 | 98.0  |
| 20    | W03248      | BW205/BW685             | 431                  | 24  | 319                     | 25.8 | 8   | 173               | 33                | 55.0 | 105.0 | 92.5  |
| 21    | W03252      | BW252/BW685             | 456                  | 10  | 275                     | 39.8 | 30  | 222               | 58                | 55.5 | 115.0 | 77.0  |
| 22    | W03330      | BW275//HW00009/99FHB359 | 426                  | 27  | 317                     | 25.6 | 7   | 158               | 38                | 57.5 | 109.5 | 95.5  |
| 23    | W03347      | BW316/P00.06-66         | 439                  | 21  | 230                     | 47.6 | 35  | 282               | 64                | 56.0 | 117.5 | 80.5  |
| 24    | W03369      | BW316/P00.06-72         | 383                  | 36  | 259                     | 32.4 | 18  | 249               | 50                | 55.5 | 116.5 | 86.5  |
| 25    | W03538      | BW693/BW279             | 444                  | 19  | 283                     | 36.3 | 28  | 182               | 66                | 56.0 | 109.0 | 92.0  |
| 26    | W03602      | BW720/FHB4              | 449                  | 15  | 318                     | 29.2 | 12  | 182               | 35                | 57.0 | 115.0 | 100.0 |
| 27    | W03647      | BW751/BW279             | 530                  | 1   | 316                     | 40.5 | 32  | 150               | 58                | 62.0 | 117.0 | 102.5 |
| 28    | W03752      | BW703*2/BW278           | 404                  | 35  | 276                     | 31.7 | 17  | 256               | 61                | 58.0 | 117.0 | 80.5  |
| 29    | W03760      | BW720*2/BW278           | 450                  | 14  | 323                     | 28.4 | 11  | 163               | 40                | 58.0 | 111.5 | 101.0 |
| 30    | W03765      | BW720*2/BW278           | 417                  | 30  | 268                     | 35.8 | 26  | 193               | 57                | 56.5 | 111.5 | 98.0  |
| 31    | W03808      | BW751/FHB5              | 408                  | 33  | 269                     | 33.9 | 22  | 233               | 53                | 57.5 | 110.5 | 88.0  |
| 32    | W04001      | BW661/Mex187            | 500                  | 4   | 299                     | 40.3 | 31  | 222               | 39                | 53.5 | 115.0 | 77.5  |

|    |         |              |      |    |      |      |    |      |    |      |       |      |
|----|---------|--------------|------|----|------|------|----|------|----|------|-------|------|
| 33 | W04002  | BW661/Mex216 | 410  | 32 | 265  | 35.4 | 25 | 214  | 52 | 53.0 | 114.5 | 71.0 |
| 34 | W04003  | BW616/Mex81  | 422  | 29 | 267  | 36.9 | 29 | 195  | 65 | 56.5 | 114.5 | 92.5 |
| 35 | W04004  | BW616/Mex82  | 422  | 28 | 247  | 41.5 | 33 | 182  | 65 | 57.0 | 110.0 | 82.0 |
| 36 | W04005  | BW616/Mex118 | 482  | 5  | 238  | 50.7 | 36 | 231  | 54 | 54.0 | 109.5 | 83.5 |
|    | Average |              | 445  |    | 300  | 32.7 |    | 180  | 47 | 56.3 | 111.4 | 92.6 |
|    | CV      |              | 10.3 |    | 12.1 |      |    | 23.6 |    | 1.63 | 3.01  | 4.78 |
|    | LSD     |              | 54   |    | 42   |      |    | 50   | 21 | 1.6  | 5.7   | 7.5  |
|    | REPS    |              | 4    |    | 4    |      |    | 4    | 4  | 2    | 2     | 2    |

Table 6. 2005 Evaluation of CDC elite bread wheat lines for competitive ability - Experiment#1

| ENTRY | NAME          | Pedigree                    | NW<br>wheat<br>yield |     | Weedy<br>wheat<br>yield |      | %  | Rnk | g m <sup>-2</sup> | g m <sup>-2</sup> | Oat<br>yield | Must<br>yield | DSE | DPM | Ht | Ldg<br>1 to<br>9 |
|-------|---------------|-----------------------------|----------------------|-----|-------------------------|------|----|-----|-------------------|-------------------|--------------|---------------|-----|-----|----|------------------|
|       |               |                             | g m <sup>-2</sup>    | Rnk | g m <sup>-2</sup>       | redn |    |     |                   |                   |              |               |     |     |    |                  |
| 1     | AC Barrie     |                             | 417                  | 48  | 207                     | 50.3 | 31 | 96  | 74                | 55                | 105.0        | 98.3          | 7.0 |     |    |                  |
| 2     | AC Superb     |                             | 430                  | 39  | 185                     | 57.1 | 57 | 98  | 69                | 53                | 106.0        | 89.5          | 6.5 |     |    |                  |
| 3     | AC Elsa       |                             | 449                  | 26  | 202                     | 55.1 | 49 | 94  | 80                | 56                | 105.5        | 93.8          | 7.0 |     |    |                  |
| 4     | AC Splendor   |                             | 385                  | 58  | 186                     | 51.8 | 37 | 80  | 66                | 52                | 97.5         | 98.0          | 7.5 |     |    |                  |
| 5     | CDC Go        |                             | 450                  | 25  | 216                     | 51.9 | 38 | 94  | 56                | 51                | 107.0        | 81.5          | 7.5 |     |    |                  |
| 6     | CDC Merlin    |                             | 373                  | 59  | 195                     | 47.7 | 22 | 102 | 70                | 55                | 106.0        | 102.0         | 7.5 |     |    |                  |
| 7     | Marquis       |                             | 331                  | 60  | 208                     | 37.2 | 1  | 76  | 62                | 60                | 110.5        | 111.3         | 8.5 |     |    |                  |
| 8     | <u>W03175</u> | ND694/P99.51#6              | 482                  | 6   | 217                     | 55.0 | 48 | 102 | 59                | 55                | 106.5        | 100.5         | 7.0 |     |    |                  |
| 9     | <u>W03176</u> | ND694/P99.51#6              | 452                  | 23  | 250                     | 44.6 | 16 | 79  | 64                | 55                | 105.5        | 100.5         | 7.5 |     |    |                  |
| 10    | <u>W03189</u> | Teal/FHB9                   | 430                  | 40  | 252                     | 41.4 | 11 | 86  | 71                | 55                | 104.0        | 109.3         | 8.0 |     |    |                  |
| 11    | <u>W03209</u> | Teal/FHB9                   | 445                  | 30  | 265                     | 40.6 | 8  | 84  | 55                | 54                | 108.5        | 107.3         | 8.0 |     |    |                  |
| 12    | <u>W03213</u> | Teal/FHB9                   | 425                  | 42  | 211                     | 50.3 | 30 | 85  | 58                | 55                | 103.0        | 98.8          | 7.0 |     |    |                  |
| 13    | <u>W03314</u> | BW275//HW00009/99FHB359(W)  | 431                  | 38  | 247                     | 42.8 | 13 | 81  | 51                | 53                | 105.0        | 100.8         | 6.5 |     |    |                  |
| 14    | <u>W03317</u> | BW275//HW00009/99FHB359(Rd) | 451                  | 24  | 238                     | 47.1 | 20 | 93  | 74                | 57                | 111.5        | 103.8         | 7.0 |     |    |                  |
| 15    | <u>W03355</u> | BW316/P00.06-72             | 409                  | 50  | 238                     | 41.8 | 12 | 66  | 64                | 54                | 105.5        | 109.5         | 8.0 |     |    |                  |
| 16    | <u>W03399</u> | BW316/P00.06-77             | 440                  | 34  | 237                     | 46.1 | 19 | 82  | 64                | 55                | 111.5        | 105.0         | 8.0 |     |    |                  |
| 17    | <u>W03194</u> | Tea/FHB9                    | 421                  | 45  | 260                     | 38.3 | 3  | 88  | 66                | 56                | 107.5        | 104.3         | 8.0 |     |    |                  |
| 18    | <u>W03211</u> | Tea/FHB9                    | 395                  | 54  | 187                     | 52.6 | 41 | 97  | 81                | 58                | 112.0        | 102.8         | 8.0 |     |    |                  |
| 19    | <u>W03215</u> | Tea/FHB9                    | 465                  | 15  | 275                     | 40.7 | 9  | 82  | 76                | 57                | 106.5        | 100.3         | 7.0 |     |    |                  |
| 20    | <u>W03234</u> | BW205/BW220                 | 512                  | 2   | 234                     | 54.3 | 47 | 83  | 59                | 55                | 111.0        | 106.0         | 6.5 |     |    |                  |
| 21    | <u>W03236</u> | BW205/BW220                 | 463                  | 16  | 233                     | 49.8 | 29 | 73  | 53                | 55                | 105.0        | 111.0         | 6.5 |     |    |                  |
| 22    | <u>W03237</u> | BW205/BW220                 | 487                  | 3   | 267                     | 45.2 | 17 | 78  | 53                | 54                | 106.0        | 108.5         | 8.0 |     |    |                  |
| 23    | <u>W03248</u> | BW205/BW685                 | 447                  | 28  | 169                     | 62.1 | 60 | 102 | 73                | 55                | 105.0        | 97.5          | 7.0 |     |    |                  |
| 24    | <u>W03330</u> | BW275//HW00009/99FHB359     | 400                  | 51  | 248                     | 38.0 | 2  | 85  | 66                | 55                | 100.5        | 98.0          | 7.5 |     |    |                  |
| 25    | <u>W03602</u> | BW720/FHB4                  | 533                  | 1   | 270                     | 49.4 | 26 | 94  | 58                | 56                | 111.5        | 105.0         | 7.5 |     |    |                  |
| 26    | W03515        | BW693/BW279                 | 439                  | 35  | 197                     | 55.2 | 50 | 83  | 70                | 54                | 107.5        | 98.0          | 6.5 |     |    |                  |
| 27    | W04138        | BW252/W98571                | 481                  | 7   | 263                     | 45.4 | 18 | 72  | 59                | 53                | 108.5        | 99.5          | 8.0 |     |    |                  |
| 28    | W04141        | BW720/98WB12                | 396                  | 53  | 237                     | 40.2 | 6  | 88  | 57                | 53                | 104.0        | 98.8          | 7.5 |     |    |                  |
| 29    | W04146        | BW720/W98571                | 457                  | 19  | 275                     | 39.9 | 5  | 92  | 62                | 53                | 98.5         | 93.8          | 6.5 |     |    |                  |
| 30    | W04152        | W98001//BW693*2/BW252       | 420                  | 46  | 200                     | 52.3 | 40 | 93  | 56                | 51                | 97.5         | 86.0          | 6.5 |     |    |                  |
| 31    | W04165        | BW205/Gus                   | 478                  | 9   | 202                     | 57.9 | 58 | 80  | 70                | 54                | 110.5        | 94.5          | 6.5 |     |    |                  |
| 32    | W04166        | BW205/Gus                   | 475                  | 11  | 191                     | 59.8 | 59 | 107 | 69                | 53                | 106.5        | 88.5          | 6.5 |     |    |                  |

|    |         |                       |     |    |      |      |    |      |      |     |       |       |      |
|----|---------|-----------------------|-----|----|------|------|----|------|------|-----|-------|-------|------|
| 33 | W04203  | BW720/FHB2            | 436 | 36 | 189  | 56.5 | 56 | 91   | 82   | 57  | 110.5 | 103.0 | 8.0  |
| 34 | W04226  | BW252*2/W93224        | 485 | 5  | 245  | 49.5 | 27 | 105  | 61   | 53  | 113.0 | 89.3  | 8.0  |
| 35 | W04238  | 97WB19/W95132         | 472 | 12 | 233  | 50.5 | 33 | 104  | 66   | 54  | 111.0 | 91.5  | 4.5  |
| 36 | W04247  | W98001//BW693*2/BW252 | 454 | 21 | 224  | 50.6 | 34 | 87   | 72   | 53  | 103.0 | 95.0  | 7.5  |
| 37 | W04248  | W98001//BW693*2/BW252 | 486 | 4  | 218  | 55.2 | 51 | 111  | 73   | 54  | 103.0 | 94.3  | 7.0  |
| 38 | W04251  | BW205/MN93413//BW205  | 422 | 43 | 197  | 53.4 | 42 | 85   | 60   | 52  | 98.5  | 99.3  | 8.0  |
| 39 | W04270  | W94194/BW685          | 448 | 27 | 200  | 55.4 | 53 | 103  | 76   | 58  | 108.0 | 100.3 | 6.0  |
| 40 | W04272  | BW685*2/W93224        | 459 | 18 | 210  | 54.3 | 46 | 95   | 75   | 56  | 104.0 | 102.0 | 6.5  |
| 41 | W04396  | BW251/BW279           | 388 | 57 | 191  | 50.7 | 35 | 83   | 54   | 53  | 109.0 | 97.0  | 7.5  |
| 42 | W04427  | BW703/BW279           | 389 | 56 | 216  | 44.5 | 15 | 92   | 74   | 54  | 105.0 | 99.3  | 8.5  |
| 43 | W04431  | BW720/BW278           | 454 | 20 | 229  | 49.6 | 28 | 88   | 70   | 55  | 110.5 | 99.8  | 6.0  |
| 44 | W04451  | BW720/FHB9            | 444 | 31 | 229  | 48.4 | 25 | 92   | 61   | 57  | 111.5 | 104.0 | 8.0  |
| 45 | W04461  | BW720/FHB9            | 469 | 14 | 209  | 55.4 | 52 | 90   | 70   | 57  | 110.5 | 98.3  | 7.0  |
| 46 | W04465  | BW720/FHB9            | 471 | 13 | 247  | 47.5 | 21 | 88   | 61   | 55  | 106.5 | 101.3 | 7.5  |
| 47 | W04469  | BW720/FHB9            | 419 | 47 | 193  | 53.9 | 44 | 102  | 65   | 54  | 101.5 | 98.5  | 6.5  |
| 48 | W04475  | BW720/FHB9            | 394 | 55 | 195  | 50.5 | 32 | 76   | 71   | 57  | 106.5 | 100.5 | 7.5  |
| 49 | W04495  | BW751*2/BW278         | 475 | 10 | 246  | 48.1 | 24 | 83   | 71   | 57  | 111.5 | 104.0 | 7.5  |
| 50 | W04606  | BW720/BW278           | 422 | 44 | 220  | 47.8 | 23 | 86   | 69   | 55  | 107.0 | 108.0 | 8.5  |
| 51 | W04618  | BW720/FHB9            | 441 | 33 | 250  | 43.4 | 14 | 67   | 58   | 55  | 110.5 | 99.5  | 7.5  |
| 52 | W04619  | BW720/FHB9            | 429 | 41 | 199  | 53.5 | 43 | 89   | 75   | 56  | 109.0 | 99.0  | 7.0  |
| 53 | W04632  | BW720/FHB9            | 453 | 22 | 217  | 52.1 | 39 | 93   | 85   | 58  | 111.5 | 106.8 | 6.5  |
| 54 | W04634  | BW720/FHB9            | 479 | 8  | 210  | 56.2 | 54 | 78   | 87   | 60  | 113.5 | 104.3 | 8.0  |
| 55 | W04637  | BW720/FHB9            | 444 | 32 | 218  | 51.0 | 36 | 90   | 80   | 58  | 111.0 | 105.0 | 7.5  |
| 56 | W04638  | BW720/FHB9            | 400 | 52 | 236  | 41.0 | 10 | 77   | 65   | 56  | 104.0 | 102.3 | 7.5  |
| 57 | W04650  | BW751*2/BW278         | 446 | 29 | 195  | 56.3 | 55 | 86   | 64   | 55  | 108.0 | 103.3 | 6.0  |
| 58 | W04690  | ND694/P99.51#6        | 415 | 49 | 252  | 39.3 | 4  | 84   | 60   | 52  | 102.0 | 96.8  | 6.0  |
| 59 | W04740  | BW316/P00.06-77       | 435 | 37 | 260  | 40.3 | 7  | 99   | 60   | 53  | 111.0 | 81.8  | 7.0  |
| 60 | W04752  | BW316/P00.38-38       | 461 | 17 | 212  | 54.1 | 45 | 101  | 74   | 53  | 111.5 | 80.8  | 5.5  |
|    | Average |                       | 441 |    | 223  |      |    | 89   | 67   | 55  | 107.0 | 99.4  | 7.2  |
|    | CV      |                       | 6.0 |    | 12.6 |      |    | 16.8 | 16.9 | 1.0 | 2.6   | 3.5   | 10.4 |
|    | LSD     |                       | 31  |    | 33   |      |    | 17   | 13   | 1   | 4.7   | 4.0   | 1.3  |
|    | REPS    |                       | 4   |    | 4    |      |    | 4    | 4    | 2   | 2     | 4     | 2    |

**Table 7. 2005 Evaluation of CDC elite bread wheat lines for competitive ability - Experiment#2**

|     |             | NW<br>wheat<br>yield |     | Weedy<br>wheat<br>yield |           |      |     | Oat<br>yield<br>g m <sup>-2</sup> | Must<br>yield<br>g m <sup>-2</sup> | DSE   | DPM   | Ht    | Ldg<br>1 to |
|-----|-------------|----------------------|-----|-------------------------|-----------|------|-----|-----------------------------------|------------------------------------|-------|-------|-------|-------------|
| TRT | Pedigree    | g m <sup>-2</sup>    | Rnk | g m <sup>-2</sup>       | %<br>redn | Rnk  |     |                                   |                                    | days  | days  | cm    | 9           |
| 1   | AC Barrie   | 396                  | 45  | 247                     | 37.7      | 25   | 93  | 67                                | 54.0                               | 103.5 | 92.5  | 7.0   |             |
| 2   | AC Superb   | 397                  | 44  | 250                     | 37.0      | 19   | 102 | 60                                | 53.0                               | 105.5 | 87.8  | 5.5   |             |
| 3   | AC Elsa     | 410                  | 36  | 254                     | 38.1      | 29   | 93  | 55                                | 55.0                               | 101.0 | 91.5  | 7.0   |             |
| 4   | AC Splendor | 379                  | 51  | 252                     | 33.6      | 10   | 90  | 53                                | 52.0                               | 97.0  | 93.8  | 7.5   |             |
| 5   | CDC Go      | 427                  | 25  | 260                     | 39.0      | 35   | 88  | 42                                | 51.5                               | 101.0 | 80.3  | 4.0   |             |
| 6   | CDC Merlin  | 385                  | 50  | 233                     | 39.5      | 39   | 89  | 60                                | 54.5                               | 102.0 | 100.5 | 7.0   |             |
| 7   | Marquis     | 322                  | 54  | 238                     | 26.0      | 1    | 70  | 56                                | 59.0                               | 111.0 | 111.0 | 8.0   |             |
| 8   | W05001      | BW661/Blueboy        | 469 | 3                       | 255       | 45.5 | 53  | 90                                | 62                                 | 56.0  | 104.5 | 99.3  | 7.0         |
| 9   | W05002      | BW661/Blueboy        | 421 | 28                      | 265       | 37.0 | 18  | 78                                | 60                                 | 55.0  | 105.0 | 96.0  | 7.5         |
| 10  | W05003      | BW661/Blueboy        | 444 | 15                      | 246       | 44.7 | 51  | 87                                | 65                                 | 55.5  | 109.0 | 96.5  | 8.0         |
| 11  | W05004      | BW661/W96355         | 445 | 13                      | 279       | 37.3 | 22  | 89                                | 67                                 | 58.5  | 109.5 | 92.5  | 6.5         |
| 12  | W05005      | BW661/96EGWYT2-20    | 432 | 22                      | 265       | 38.7 | 34  | 76                                | 61                                 | 53.0  | 101.0 | 99.8  | 7.0         |
| 13  | W05006      | BW661/96EGWYT2-20    | 427 | 23                      | 255       | 40.3 | 43  | 79                                | 60                                 | 55.0  | 101.0 | 102.5 | 7.5         |
| 14  | W05007      | BW661//Teal/W95413   | 470 | 2                       | 280       | 40.4 | 44  | 94                                | 66                                 | 58.5  | 109.5 | 94.5  | 6.0         |
| 15  | W05008      | BW661//Teal/W95413   | 416 | 30                      | 240       | 42.2 | 48  | 99                                | 66                                 | 53.0  | 100.5 | 89.5  | 6.0         |
| 16  | W05009      | BW661//Teal/W95413   | 415 | 31                      | 255       | 38.6 | 32  | 83                                | 63                                 | 54.5  | 107.5 | 92.5  | 7.5         |
| 17  | W05010      | MS*6/BW 661          | 465 | 5                       | 266       | 42.8 | 49  | 79                                | 67                                 | 55.0  | 106.5 | 95.8  | 7.5         |
| 18  | W05011      | MS*6/BW 661          | 416 | 29                      | 258       | 38.1 | 28  | 85                                | 57                                 | 54.5  | 102.5 | 91.3  | 6.5         |
| 19  | W05012      | Teal*3/Seneca-283    | 468 | 4                       | 293       | 37.4 | 23  | 74                                | 61                                 | 55.5  | 102.0 | 98.8  | 7.5         |
| 20  | W05013      | Teal*3/Seneca-283    | 449 | 11                      | 304       | 32.2 | 4   | 92                                | 43                                 | 55.5  | 101.0 | 99.0  | 6.0         |
| 21  | W05014      | BW693*2/BW252        | 413 | 34                      | 217       | 47.5 | 54  | 109                               | 65                                 | 53.5  | 105.0 | 84.3  | 5.0         |
| 22  | W05015      | BW685*2/W93224       | 481 | 1                       | 266       | 44.7 | 50  | 89                                | 64                                 | 57.0  | 109.5 | 82.5  | 4.5         |
| 23  | W05016      | BW685*2/W93224       | 443 | 16                      | 257       | 42.0 | 47  | 91                                | 64                                 | 55.5  | 107.5 | 80.8  | 4.5         |
| 24  | W05017      | BW685*2/W93224       | 399 | 42                      | 240       | 39.9 | 41  | 93                                | 72                                 | 54.5  | 102.5 | 89.3  | 5.0         |
| 25  | W05018      | Teal/BW173(F3)//Teal | 458 | 6                       | 310       | 32.3 | 5   | 90                                | 63                                 | 54.0  | 100.0 | 91.5  | 7.5         |
| 26  | W05019      | Teal/BW173(F3)//Teal | 451 | 8                       | 287       | 36.4 | 16  | 90                                | 54                                 | 55.0  | 104.5 | 95.0  | 7.0         |
| 27  | W05020      | Teal/BW173(F3)//Teal | 442 | 17                      | 292       | 34.0 | 11  | 79                                | 56                                 | 55.5  | 103.5 | 94.0  | 6.5         |
| 28  | W05021      | Teal/BW173(F3)//Teal | 427 | 26                      | 288       | 32.4 | 6   | 80                                | 53                                 | 55.0  | 99.5  | 87.8  | 6.0         |
| 29  | W05022      | Teal/BW173(F3)//Teal | 432 | 20                      | 253       | 41.5 | 46  | 83                                | 54                                 | 55.0  | 106.5 | 87.8  | 7.0         |
| 30  | W05023      | Teal/BW173(F3)//Teal | 401 | 41                      | 260       | 35.1 | 14  | 82                                | 47                                 | 55.5  | 103.0 | 90.3  | 6.0         |
| 31  | W05024      | Teal/BW173(F3)//Teal | 397 | 43                      | 247       | 37.9 | 26  | 69                                | 64                                 | 56.5  | 103.5 | 91.3  | 6.5         |
| 32  | W05025      | Teal/BW173(F3)//Teal | 386 | 49                      | 231       | 40.2 | 42  | 95                                | 63                                 | 53.0  | 100.0 | 89.8  | 6.5         |

|    |         |                           |     |    |      |      |    |      |      |      |       |       |      |
|----|---------|---------------------------|-----|----|------|------|----|------|------|------|-------|-------|------|
| 33 | W05026  | Teal/BW173(F3)//Teal      | 432 | 20 | 272  | 37.1 | 20 | 78   | 51   | 54.0 | 105.5 | 95.8  | 7.5  |
| 34 | W05027  | Teal/BW173(F3)//Teal      | 433 | 19 | 292  | 32.4 | 7  | 78   | 45   | 54.5 | 102.0 | 93.0  | 5.5  |
| 35 | W05028  | Teal/BW173(F3)//Teal      | 451 | 9  | 277  | 38.6 | 33 | 81   | 48   | 53.0 | 103.0 | 90.8  | 5.5  |
| 36 | W05029  | Teal/ND2710//Teal/MN93413 | 411 | 35 | 224  | 45.5 | 52 | 83   | 71   | 55.5 | 104.5 | 95.3  | 8.5  |
| 37 | W05030  | Teal*2/Bacup              | 445 | 14 | 305  | 31.4 | 3  | 79   | 55   | 55.0 | 101.0 | 99.3  | 6.5  |
| 38 | W05031  | Teal/BW277                | 415 | 32 | 253  | 39.0 | 36 | 88   | 54   | 53.5 | 99.5  | 87.5  | 5.0  |
| 39 | W05032  | Teal/BW277                | 402 | 40 | 240  | 40.4 | 45 | 95   | 57   | 56.5 | 103.5 | 85.3  | 6.0  |
| 40 | W05033  | Teal/BW277                | 350 | 53 | 233  | 33.6 | 9  | 103  | 57   | 56.0 | 103.0 | 83.0  | 7.0  |
| 41 | W05034  | Teal/BW277                | 403 | 39 | 290  | 28.1 | 2  | 84   | 51   | 57.0 | 108.0 | 93.8  | 7.5  |
| 42 | W05035  | Teal/BW278                | 379 | 52 | 231  | 39.1 | 37 | 84   | 51   | 56.0 | 109.5 | 97.0  | 6.0  |
| 43 | W05036  | Teal/BW279                | 454 | 7  | 282  | 37.9 | 27 | 71   | 62   | 54.5 | 103.0 | 96.5  | 7.0  |
| 44 | W05037  | BW693/BW277               | 414 | 33 | 251  | 39.4 | 38 | 80   | 52   | 53.5 | 99.5  | 96.5  | 8.0  |
| 45 | W05038  | BW693/BW277               | 391 | 46 | 255  | 34.9 | 13 | 84   | 66   | 55.0 | 105.5 | 96.5  | 8.0  |
| 46 | W05039  | BW693/BW277               | 451 | 10 | 290  | 35.7 | 15 | 74   | 54   | 55.5 | 105.5 | 100.5 | 6.0  |
| 47 | W05040  | BW693/BW279               | 447 | 12 | 292  | 34.6 | 12 | 89   | 49   | 54.0 | 103.0 | 93.0  | 5.0  |
| 48 | W05041  | BW693/BW279               | 388 | 48 | 240  | 38.2 | 30 | 90   | 54   | 52.0 | 98.0  | 93.8  | 8.0  |
| 49 | W05042  | BW693/BW279               | 390 | 47 | 244  | 37.3 | 21 | 82   | 55   | 52.0 | 97.0  | 90.8  | 5.0  |
| 50 | W05043  | BW693/BW279               | 423 | 27 | 256  | 39.5 | 40 | 98   | 58   | 54.0 | 100.0 | 90.3  | 5.5  |
| 51 | W05044  | BW693/BW279               | 408 | 37 | 252  | 38.3 | 31 | 86   | 55   | 53.5 | 102.5 | 94.5  | 7.0  |
| 52 | W05045  | BW693/BW279               | 436 | 18 | 277  | 36.5 | 17 | 91   | 45   | 54.0 | 103.0 | 90.3  | 5.5  |
| 53 | W05046  | BW693/BW279               | 427 | 24 | 267  | 37.6 | 24 | 90   | 59   | 54.0 | 101.0 | 95.5  | 7.0  |
| 54 | W05047  | BW693/BW279               | 404 | 38 | 271  | 33.0 | 8  | 82   | 46   | 54.0 | 98.0  | 92.8  | 6.5  |
|    | Average |                           | 421 |    | 262  | 37.8 |    | 86   | 57   | 54.7 | 103.4 | 93.0  | 6.5  |
|    | CV      |                           | 6.7 |    | 10.6 |      |    | 16.4 | 20.8 | 1.1  | 2.8   | 4.3   | 13.3 |
|    | LSD     |                           | 33  |    | 33   |      |    | 17   | 14   | 1.0  | 4.9   | 4.7   | 1.4  |
|    | REPS    |                           | 4   |    | 4    |      |    | 4    | 4    | 2    | 2     | 4     | 2    |

**Table 8. 2006 Evaluation of CDC elite bread wheat lines for competitive ability - Experiment#1**

| ENTRY | NAME          | Pedigree                    | NW<br>wheat<br>yield |     | Weedy<br>wheat<br>yield |      | %<br>redn | Rnk | Oat<br>yield<br>g m <sup>-2</sup> | Must<br>yield<br>g m <sup>-2</sup> | DSE  | DPM   | Ht  | Ldg<br>1 to<br>9 |
|-------|---------------|-----------------------------|----------------------|-----|-------------------------|------|-----------|-----|-----------------------------------|------------------------------------|------|-------|-----|------------------|
|       |               |                             | g m <sup>-2</sup>    | Rnk | g m <sup>-2</sup>       |      |           |     |                                   |                                    |      |       |     |                  |
| 1     | AC Barrie     |                             | 399                  | 29  | 251                     | 37.1 | 6         | 72  | 21                                | 51.3                               | 87.5 | 97.0  | 1.0 |                  |
| 2     | AC Superb     |                             | 424                  | 7   | 253                     | 40.3 | 21        | 102 | 24                                | 49.8                               | 88.0 | 84.7  | 1.0 |                  |
| 3     | AC Elsa       |                             | 396                  | 32  | 230                     | 41.9 | 28        | 95  | 28                                | 51.3                               | 85.0 | 89.0  | 2.3 |                  |
| 4     | AC Splendor   |                             | 350                  | 55  | 216                     | 38.3 | 9         | 78  | 19                                | 49.0                               | 82.5 | 91.7  | 2.0 |                  |
| 5     | CDC Go        |                             | 443                  | 2   | 267                     | 39.7 | 16        | 110 | 22                                | 48.8                               | 87.5 | 84.0  | 1.0 |                  |
| 6     | CDC Merlin    |                             | 350                  | 56  | 231                     | 33.8 | 2         | 78  | 20                                | 51.0                               | 86.5 | 99.0  | 3.0 |                  |
| 7     | Marquis       |                             | 301                  | 59  | 165                     | 45.0 | 44        | 85  | 34                                | 53.8                               | 90.0 | 98.7  | 3.7 |                  |
| 8     | <u>W03176</u> | ND694/P99.51#6              | 436                  | 4   | 266                     | 39.1 | 11        | 99  | 24                                | 51.0                               | 86.5 | 93.0  | 6.0 |                  |
| 9     | <u>W03189</u> | Teal/FHB9                   | 375                  | 50  | 232                     | 38.0 | 8         | 84  | 19                                | 51.0                               | 84.5 | 96.3  | 4.3 |                  |
| 10    | <u>W03209</u> | Teal/FHB9                   | 417                  | 16  | 252                     | 39.6 | 15        | 111 | 23                                | 51.3                               | 89.5 | 102.0 | 7.0 |                  |
| 11    | <u>W03314</u> | BW275//HW00009/99FHB359(VV) | 298                  | 60  | 198                     | 33.6 | 1         | 74  | 20                                | 49.5                               | 86.0 | 96.3  | 1.3 |                  |
| 12    | <u>W03317</u> | BW275//HW00009/99FHB359(Rd) | 381                  | 47  | 232                     | 39.2 | 12        | 94  | 27                                | 53.0                               | 87.0 | 94.3  | 1.3 |                  |
| 13    | <u>W03399</u> | BW316/P00.06-77             | 386                  | 41  | 219                     | 43.3 | 33        | 90  | 27                                | 50.5                               | 88.0 | 96.3  | 1.0 |                  |
| 14    | <u>W03194</u> | Teal/FHB9                   | 420                  | 13  | 223                     | 46.8 | 55        | 91  | 31                                | 52.8                               | 88.0 | 101.0 | 3.3 |                  |
| 15    | <u>W03215</u> | Teal/FHB9                   | 429                  | 6   | 261                     | 39.2 | 13        | 105 | 27                                | 53.0                               | 88.0 | 95.0  | 2.7 |                  |
| 16    | <u>W03237</u> | BW205/BW220                 | 403                  | 27  | 223                     | 44.7 | 42        | 95  | 26                                | 50.8                               | 87.5 | 97.3  | 2.7 |                  |
| 17    | <u>W03602</u> | BW720/FHB4                  | 421                  | 10  | 219                     | 48.0 | 57        | 93  | 24                                | 51.8                               | 88.0 | 93.7  | 2.0 |                  |
| 18    | <u>W04138</u> | BW252/W98571                | 419                  | 15  | 251                     | 40.1 | 18        | 77  | 20                                | 50.3                               | 86.5 | 95.0  | 1.3 |                  |
| 19    | <u>W04146</u> | BW720/W98571                | 421                  | 12  | 247                     | 41.2 | 23        | 85  | 24                                | 50.3                               | 85.0 | 94.3  | 1.0 |                  |
| 20    | <u>W04465</u> | BW720/FHB9                  | 403                  | 24  | 256                     | 36.6 | 5         | 89  | 26                                | 52.3                               | 85.5 | 88.3  | 1.7 |                  |
| 21    | <u>W04606</u> | BW720/BW278                 | 320                  | 58  | 178                     | 44.4 | 39        | 111 | 33                                | 52.0                               | 88.5 | 100.7 | 1.0 |                  |
| 22    | <u>W04618</u> | BW720/FHB9                  | 381                  | 46  | 204                     | 46.5 | 52        | 107 | 26                                | 51.0                               | 88.0 | 90.3  | 2.3 |                  |
| 23    | <u>W04740</u> | BW316/P00.06-77             | 404                  | 22  | 217                     | 46.4 | 51        | 122 | 40                                | 49.5                               | 91.5 | 82.3  | 1.0 |                  |
| 24    | <u>W05002</u> | BW661/Blueboy               | 351                  | 54  | 194                     | 44.7 | 41        | 88  | 27                                | 51.5                               | 87.5 | 89.7  | 1.3 |                  |
| 25    | <u>W05004</u> | BW661/W96355                | 396                  | 30  | 219                     | 44.8 | 43        | 77  | 22                                | 52.8                               | 89.5 | 88.3  | 2.3 |                  |
| 26    | <u>W05012</u> | Teal*3/Seneca-283           | 394                  | 35  | 231                     | 41.3 | 25        | 85  | 27                                | 51.8                               | 87.5 | 91.3  | 1.3 |                  |
| 27    | <u>W05013</u> | Teal*3/Seneca-283           | 379                  | 48  | 218                     | 42.6 | 30        | 92  | 29                                | 52.3                               | 87.0 | 96.0  | 1.3 |                  |
| 28    | <u>W05018</u> | Teal/BW173(F3)//Teal        | 395                  | 34  | 232                     | 41.2 | 24        | 82  | 22                                | 50.5                               | 85.0 | 87.3  | 1.3 |                  |
| 29    | <u>W05019</u> | Teal/BW173(F3)//Teal        | 389                  | 40  | 230                     | 40.9 | 22        | 85  | 24                                | 51.3                               | 85.5 | 87.3  | 1.3 |                  |
| 30    | <u>W05020</u> | Teal/BW173(F3)//Teal        | 414                  | 17  | 242                     | 41.4 | 26        | 91  | 21                                | 51.0                               | 87.0 | 91.7  | 1.7 |                  |
| 31    | <u>W05021</u> | Teal/BW173(F3)//Teal        | 430                  | 5   | 244                     | 43.3 | 34        | 90  | 30                                | 51.3                               | 89.0 | 93.0  | 1.7 |                  |
| 32    | <u>W05023</u> | Teal/BW173(F3)//Teal        | 381                  | 45  | 215                     | 43.6 | 35        | 92  | 23                                | 51.8                               | 85.5 | 87.7  | 1.0 |                  |
| 33    | <u>W05026</u> | Teal/BW173(F3)//Teal        | 401                  | 28  | 225                     | 43.8 | 36        | 84  | 25                                | 51.0                               | 87.0 | 91.3  | 1.3 |                  |

|    |         |                       |     |    |     |      |    |      |      |      |      |      |      |
|----|---------|-----------------------|-----|----|-----|------|----|------|------|------|------|------|------|
| 34 | W05027  | Teal/BW173(F3)//Teal  | 408 | 20 | 229 | 43.9 | 37 | 85   | 29   | 50.8 | 86.5 | 89.7 | 2.7  |
| 35 | W05030  | Teal*2/Bacup          | 413 | 19 | 225 | 45.6 | 46 | 111  | 36   | 51.3 | 88.5 | 91.7 | 2.3  |
| 36 | W05034  | Teal/BW277            | 443 | 1  | 265 | 40.2 | 20 | 91   | 26   | 51.0 | 89.0 | 91.0 | 3.0  |
| 37 | W05039  | BW693/BW277           | 390 | 39 | 203 | 47.9 | 56 | 90   | 27   | 52.0 | 85.0 | 93.0 | 1.3  |
| 38 | W05040  | BW693/BW279           | 393 | 36 | 212 | 46.0 | 48 | 88   | 28   | 50.5 | 85.0 | 87.7 | 1.3  |
| 39 | W05045  | BW693/BW279           | 383 | 43 | 208 | 45.6 | 47 | 111  | 42   | 50.3 | 86.5 | 94.0 | 1.3  |
| 40 | W05046  | BW693/BW279           | 395 | 33 | 219 | 44.5 | 40 | 94   | 19   | 50.8 | 85.0 | 88.3 | 2.3  |
| 41 | W05047  | BW693/BW279           | 368 | 52 | 220 | 40.1 | 19 | 91   | 29   | 50.0 | 86.0 | 91.3 | 1.3  |
| 42 | W05209  | BW720*2/BW278         | 379 | 49 | 202 | 46.8 | 54 | 94   | 23   | 51.5 | 84.0 | 76.3 | 2.3  |
| 43 | W05211  | W98001//BW661/Cezanne | 413 | 18 | 176 | 57.3 | 60 | 94   | 34   | 53.5 | 89.5 | 87.3 | 1.0  |
| 44 | W05218  | W98332/W98001         | 386 | 42 | 240 | 37.8 | 7  | 91   | 29   | 49.0 | 85.0 | 92.3 | 2.3  |
| 45 | W05221  | W98332/W98001         | 403 | 25 | 216 | 46.3 | 49 | 109  | 32   | 53.3 | 85.5 | 91.0 | 1.0  |
| 46 | W05222  | W98332/W98001         | 357 | 53 | 234 | 34.5 | 3  | 86   | 25   | 50.0 | 85.0 | 92.3 | 2.3  |
| 47 | W05223  | W98332/W98001         | 391 | 38 | 252 | 35.7 | 4  | 74   | 22   | 50.8 | 83.0 | 85.7 | 3.7  |
| 48 | W05224  | W98332/W98001         | 382 | 44 | 213 | 44.3 | 38 | 100  | 32   | 52.5 | 88.0 | 89.3 | 1.3  |
| 49 | W05227  | W98332/W98001         | 422 | 8  | 260 | 38.3 | 10 | 93   | 30   | 51.8 | 87.0 | 93.0 | 1.3  |
| 50 | W05228  | W98332/W98001         | 407 | 21 | 233 | 42.8 | 31 | 96   | 34   | 54.0 | 91.5 | 95.3 | 1.7  |
| 51 | W05230  | W98332/W98001         | 340 | 57 | 207 | 39.2 | 14 | 92   | 29   | 50.3 | 86.0 | 86.7 | 1.7  |
| 52 | W05234  | W98332/W98001         | 392 | 37 | 210 | 46.4 | 50 | 76   | 32   | 52.5 | 86.5 | 92.0 | 1.0  |
| 53 | W05236  | W98332/W98001         | 369 | 51 | 221 | 40.1 | 17 | 100  | 30   | 50.0 | 85.5 | 88.7 | 2.0  |
| 54 | W05237  | W98332/W98001         | 396 | 31 | 228 | 42.4 | 29 | 98   | 24   | 49.8 | 84.5 | 86.3 | 3.0  |
| 55 | W05243  | Teal*3/BW173          | 422 | 9  | 225 | 46.7 | 53 | 113  | 35   | 54.0 | 89.0 | 91.7 | 2.0  |
| 56 | W05245  | Teal*3/BW173          | 421 | 11 | 207 | 50.8 | 59 | 100  | 38   | 53.3 | 89.0 | 94.0 | 2.0  |
| 57 | W05246  | Teal*3/BW173          | 420 | 14 | 212 | 49.5 | 58 | 101  | 34   | 53.8 | 88.0 | 93.7 | 2.0  |
| 58 | W05247  | Teal*3/BW173          | 404 | 22 | 220 | 45.5 | 45 | 102  | 23   | 52.8 | 87.5 | 91.3 | 2.7  |
| 59 | W05248  | Teal*3/BW173          | 441 | 3  | 258 | 41.5 | 27 | 96   | 27   | 52.3 | 87.5 | 90.0 | 2.0  |
| 60 | W05258  | BW252/W98096          | 403 | 26 | 229 | 43.1 | 32 | 100  | 29   | 49.0 | 86.0 | 90.0 | 1.0  |
|    | Average |                       | 394 |    | 226 |      |    | 93   | 27   | 51.3 | 86.9 | 91.6 | 2.0  |
|    | CV      |                       | 5.2 |    | 7.0 |      |    | 15.1 | 22.9 | 1.1  | 2.0  | 6.1  | 29.8 |
|    | LSD     |                       | 24  |    | 19  |      |    | 17   | 7    | 0.7  | 2.9  | 7.5  | 0.8  |
|    | REPS    |                       | 4   |    | 4   |      |    | 4    | 4    | 4    | 2    | 3    | 3    |

**Table 9. 2006 Evaluation of CDC elite bread wheat lines for competitive ability - Expermiment#2**

| ENTRY | NAME        | Pedigree                 | NW<br>wheat<br>yield |     | Weedy<br>wheat<br>yield |      | %<br>redn | Rnk | Oat<br>yield<br>g m <sup>-2</sup> | Must<br>yield<br>g m <sup>-2</sup> | DSE  | DPM   | Ht  | Ldg<br>1 to<br>9 |
|-------|-------------|--------------------------|----------------------|-----|-------------------------|------|-----------|-----|-----------------------------------|------------------------------------|------|-------|-----|------------------|
|       |             |                          | g m <sup>-2</sup>    | Rnk | g m <sup>-2</sup>       |      |           |     |                                   |                                    |      |       |     |                  |
| 1     | AC Barrie   |                          | 406                  | 15  | 286                     | 29.7 | 7         | 59  | 30                                | 51.5                               | 86.5 | 97.0  | 2.0 |                  |
| 2     | AC Superb   |                          | 456                  | 1   | 298                     | 34.7 | 29        | 79  | 26                                | 49.8                               | 89.5 | 89.0  | 1.0 |                  |
| 3     | AC Elsa     |                          | 383                  | 37  | 250                     | 34.7 | 30        | 71  | 36                                | 52.3                               | 88.5 | 93.7  | 3.7 |                  |
| 4     | AC Splendor |                          | 358                  | 50  | 231                     | 35.6 | 34        | 69  | 26                                | 49.0                               | 83.0 | 96.0  | 2.3 |                  |
| 5     | CDC Go      |                          | 428                  | 8   | 284                     | 33.6 | 25        | 81  | 26                                | 48.8                               | 87.0 | 87.0  | 1.3 |                  |
| 6     | CDC Merlin  |                          | 359                  | 49  | 244                     | 32.0 | 15        | 70  | 23                                | 51.5                               | 88.0 | 100.0 | 3.3 |                  |
| 7     | Marquis     |                          | 279                  | 54  | 190                     | 31.8 | 13        | 75  | 37                                | 53.8                               | 89.0 | 102.3 | 5.7 |                  |
| 8     | W05265      | BW252*2/W98135           | 423                  | 10  | 266                     | 37.1 | 42        | 73  | 26                                | 49.0                               | 89.0 | 89.7  | 1.0 |                  |
| 9     | W05281      | BW720*2/BW277            | 376                  | 42  | 255                     | 32.1 | 16        | 69  | 31                                | 51.0                               | 87.0 | 95.7  | 4.0 |                  |
| 10    | W05284      | W98001/99WB8             | 366                  | 46  | 246                     | 32.9 | 17        | 69  | 30                                | 50.3                               | 87.0 | 94.0  | 2.3 |                  |
| 11    | W05287      | W98001/99WB8             | 414                  | 13  | 266                     | 35.8 | 35        | 77  | 33                                | 50.0                               | 86.0 | 94.0  | 2.3 |                  |
| 12    | W05288      | W98001/99WB8             | 384                  | 35  | 282                     | 26.5 | 1         | 63  | 27                                | 51.0                               | 87.0 | 97.7  | 5.0 |                  |
| 13    | W05289      | W98001/99WB8             | 399                  | 21  | 267                     | 33.1 | 19        | 72  | 28                                | 51.3                               | 87.0 | 98.7  | 2.0 |                  |
| 14    | W05290      | W98001/99WB8             | 389                  | 30  | 251                     | 35.4 | 33        | 61  | 33                                | 50.5                               | 87.0 | 99.3  | 2.3 |                  |
| 15    | W05291      | W98001/99WB8             | 360                  | 48  | 248                     | 31.2 | 10        | 73  | 31                                | 50.0                               | 86.5 | 93.0  | 1.7 |                  |
| 16    | W05292      | W98001/BW768             | 399                  | 20  | 253                     | 36.7 | 38        | 62  | 31                                | 51.0                               | 90.0 | 95.0  | 1.0 |                  |
| 17    | W05293      | W98001/BW768             | 394                  | 24  | 263                     | 33.3 | 21        | 65  | 31                                | 50.8                               | 87.0 | 93.7  | 1.3 |                  |
| 18    | W05294      | W98001/BW768             | 377                  | 40  | 235                     | 37.7 | 45        | 75  | 31                                | 50.5                               | 86.5 | 95.3  | 1.0 |                  |
| 19    | W05297      | W98001/BW768             | 384                  | 36  | 225                     | 41.4 | 53        | 78  | 36                                | 52.5                               | 87.5 | 95.7  | 1.7 |                  |
| 20    | W05298      | W98001*2/BW277           | 351                  | 52  | 194                     | 44.7 | 54        | 66  | 32                                | 53.5                               | 91.0 | 98.0  | 1.0 |                  |
| 21    | W05299      | W98001*2/BW277           | 356                  | 51  | 238                     | 33.1 | 20        | 75  | 29                                | 50.8                               | 88.0 | 102.7 | 1.7 |                  |
| 22    | W05302      | Elsa/KS 96 WGRC 36       | 402                  | 18  | 262                     | 34.9 | 31        | 69  | 33                                | 52.3                               | 88.5 | 93.0  | 3.0 |                  |
| 23    | W05305      | Elsa/KS 96 WGRC 36       | 398                  | 22  | 252                     | 36.8 | 39        | 68  | 36                                | 52.5                               | 88.0 | 93.7  | 2.7 |                  |
| 24    | W05306      | Elsa/KS 96 WGRC 36       | 394                  | 25  | 244                     | 38.0 | 46        | 72  | 35                                | 52.8                               | 87.0 | 93.3  | 3.3 |                  |
| 25    | W05307      | Elsa/KS 96 WGRC 36       | 387                  | 34  | 243                     | 37.1 | 41        | 81  | 35                                | 51.8                               | 88.0 | 94.3  | 2.3 |                  |
| 26    | W05315      | BW252*2/PGR18751         | 443                  | 3   | 279                     | 37.1 | 40        | 68  | 30                                | 50.0                               | 89.5 | 91.7  | 1.3 |                  |
| 27    | W05319      | BW720//BW661/KS96WGRC 37 | 429                  | 7   | 264                     | 38.4 | 49        | 69  | 38                                | 53.5                               | 88.0 | 92.7  | 2.3 |                  |
| 28    | W05324      | MS*7/661                 | 391                  | 28  | 260                     | 33.4 | 22        | 58  | 29                                | 51.0                               | 86.5 | 97.0  | 2.7 |                  |
| 29    | W05325      | MS*7/661                 | 401                  | 19  | 288                     | 28.2 | 3         | 63  | 28                                | 51.8                               | 87.0 | 96.3  | 3.0 |                  |
| 30    | W05326      | MS*7/661                 | 402                  | 17  | 263                     | 34.5 | 28        | 73  | 35                                | 51.0                               | 87.0 | 94.0  | 2.3 |                  |
| 31    | W05328      | MS*7/661                 | 388                  | 31  | 253                     | 34.9 | 32        | 66  | 26                                | 51.5                               | 87.0 | 96.0  | 1.3 |                  |
| 32    | W05335      | BW720*2/BW278            | 395                  | 23  | 269                     | 32.0 | 14        | 75  | 28                                | 52.8                               | 88.5 | 95.7  | 3.3 |                  |
| 33    | W05339      | BW277/W98001             | 388                  | 33  | 258                     | 33.5 | 23        | 70  | 29                                | 49.0                               | 85.0 | 94.7  | 2.3 |                  |

|    |         |                   |     |    |     |      |    |      |      |      |      |       |      |
|----|---------|-------------------|-----|----|-----|------|----|------|------|------|------|-------|------|
| 34 | W05340  | BW720*2/BW277     | 404 | 16 | 258 | 36.3 | 37 | 75   | 32   | 51.8 | 84.5 | 99.7  | 2.7  |
| 35 | W05343  | HW00009/BW275     | 377 | 39 | 232 | 38.5 | 51 | 70   | 37   | 52.8 | 90.0 | 88.3  | 1.0  |
| 36 | W05344  | W98001*2/BW277    | 372 | 43 | 246 | 34.0 | 27 | 78   | 22   | 50.3 | 86.5 | 100.0 | 2.0  |
| 37 | W05353  | 03Path rows       | 436 | 5  | 289 | 33.7 | 26 | 66   | 24   | 49.3 | 87.0 | 97.0  | 2.3  |
| 38 | W05355  | 03Path rows       | 391 | 27 | 283 | 27.7 | 2  | 77   | 20   | 51.0 | 86.5 | 101.0 | 5.3  |
| 39 | W05358  | 03Path rows       | 306 | 53 | 211 | 31.2 | 11 | 73   | 24   | 53.0 | 89.0 | 100.0 | 4.7  |
| 40 | W05359  | BW720*2/BW277     | 376 | 41 | 257 | 31.7 | 12 | 66   | 26   | 52.8 | 86.5 | 101.0 | 4.7  |
| 41 | W05360  | W98001*2/BW277    | 368 | 45 | 230 | 37.5 | 43 | 70   | 34   | 51.5 | 88.0 | 96.7  | 1.3  |
| 42 | W05363  | Bounty/BW282      | 442 | 4  | 272 | 38.5 | 50 | 74   | 30   | 50.3 | 88.5 | 91.7  | 2.0  |
| 43 | W05364  | Bounty/BW282      | 369 | 44 | 263 | 28.6 | 4  | 78   | 25   | 50.3 | 84.0 | 94.7  | 5.7  |
| 44 | W05366  | Bounty/BW282      | 426 | 9  | 266 | 37.7 | 44 | 72   | 36   | 53.0 | 90.0 | 101.3 | 3.7  |
| 45 | W05369  | Bounty/BW282      | 389 | 29 | 269 | 30.8 | 9  | 69   | 27   | 51.0 | 86.0 | 92.7  | 4.0  |
| 46 | W05371  | Bounty/BW282      | 414 | 12 | 250 | 39.7 | 52 | 75   | 33   | 51.0 | 87.5 | 93.0  | 3.0  |
| 47 | W05372  | Bounty/BW282      | 407 | 14 | 252 | 38.2 | 48 | 57   | 30   | 50.3 | 85.0 | 94.0  | 2.7  |
| 48 | W05373  | Bounty/BW282      | 433 | 6  | 268 | 38.1 | 47 | 59   | 32   | 50.5 | 86.0 | 91.3  | 2.7  |
| 49 | W05376  | Bounty/BW282      | 388 | 32 | 275 | 29.2 | 6  | 73   | 26   | 50.0 | 85.5 | 91.0  | 2.0  |
| 50 | W05378  | Bounty/BW282      | 445 | 2  | 317 | 28.7 | 5  | 66   | 28   | 50.3 | 87.0 | 93.3  | 3.0  |
| 51 | W05388  | BW 256/P99.51-73  | 362 | 47 | 233 | 35.8 | 36 | 60   | 31   | 49.0 | 86.5 | 91.3  | 1.3  |
| 52 | W05410  | BW 282/P99.51-145 | 393 | 26 | 264 | 32.9 | 18 | 70   | 28   | 49.3 | 86.0 | 96.7  | 6.7  |
| 53 | W05420  | BW 282/P99.51-145 | 415 | 11 | 276 | 33.5 | 24 | 83   | 34   | 50.8 | 88.0 | 90.0  | 2.7  |
| 54 | W05455  | PT554/99FHB359    | 380 | 38 | 266 | 30.2 | 8  | 58   | 27   | 48.8 | 87.0 | 91.7  | 5.0  |
|    | Average |                   | 392 |    | 257 |      |    | 70   | 30   | 51.0 | 87.3 | 95.1  | 2.7  |
|    | CV      |                   | 6.7 |    | 7.6 |      |    | 16.4 | 19.7 | 0.9  | 1.7  | 4.5   | 33.7 |
|    | LSD     |                   | 31  |    | 23  |      |    | 14   | 7    | 0.6  | 2.5  | 5.8   | 1.2  |
|    | REPS    |                   | 4   |    | 4   |      |    | 4    | 4    | 4    | 2    | 3     | 3    |

**Table 10. 2007 Evaluation of CDC elite bread wheat lines for competitive ability**

| ENTRY | NAME        | Pedigree             | NW                                  |     | Weedy                               |           | Oat<br>yield<br>g m <sup>-2</sup> | Must<br>yield<br>g m <sup>-2</sup> | DSE | DPM  | Ht   |       |
|-------|-------------|----------------------|-------------------------------------|-----|-------------------------------------|-----------|-----------------------------------|------------------------------------|-----|------|------|-------|
|       |             |                      | wheat<br>yield<br>g m <sup>-2</sup> | Rnk | wheat<br>yield<br>g m <sup>-2</sup> | %<br>redn |                                   |                                    |     |      |      | Rnk   |
| 1     | AC Barrie   |                      | 251                                 | 56  | 163                                 | 34.8      | 32                                | 78                                 | 28  | 56.0 | 86.8 | 100.3 |
| 2     | AC Superb   |                      | 318                                 | 16  | 221                                 | 30.5      | 14                                | 80                                 | 25  | 53.8 | 87.5 | 92.3  |
| 3     | AC Elsa     |                      | 247                                 | 59  | 143                                 | 42.3      | 62                                | 107                                | 28  | 57.0 | 85.8 | 96.0  |
| 4     | AC Splendor |                      | 281                                 | 35  | 199                                 | 29.1      | 7                                 | 77                                 | 22  | 52.5 | 80.5 | 100.0 |
| 5     | CDC Go      |                      | 333                                 | 11  | 228                                 | 31.7      | 17                                | 86                                 | 20  | 52.3 | 84.0 | 84.0  |
| 6     | CDC Merlin  |                      | 161                                 | 64  | 97                                  | 39.7      | 50                                | 102                                | 31  | 56.0 | 86.8 | 106.3 |
| 7     | Marquis     |                      | 163                                 | 63  | 102                                 | 37.1      | 40                                | 83                                 | 38  | 60.0 | 90.3 | 113.7 |
| 8     | Red Fife    |                      | 269                                 | 48  | 158                                 | 41.1      | 57                                | 85                                 | 33  | 61.0 | 92.0 | 117.0 |
| 9     | CDC Bounty  |                      | 243                                 | 61  | 145                                 | 40.6      | 56                                | 91                                 | 32  | 57.5 | 85.8 | 104.3 |
| 10    | Lovitt      |                      | 212                                 | 62  | 148                                 | 29.9      | 12                                | 75                                 | 33  | 56.5 | 85.0 | 106.3 |
| 11    | W03176      | ND694/P99.51#6       | 323                                 | 15  | 188                                 | 41.7      | 59                                | 93                                 | 29  | 56.3 | 87.5 | 98.7  |
| 12    | W03209      | Teal/FHB9            | 271                                 | 44  | 183                                 | 32.3      | 21                                | 83                                 | 37  | 56.0 | 85.8 | 105.3 |
| 13    | W03215      | Teal/FHB9            | 273                                 | 39  | 196                                 | 28.1      | 4                                 | 89                                 | 31  | 57.8 | 88.8 | 102.7 |
| 14    | W04138      | BW252/W98571         | 273                                 | 41  | 185                                 | 32.1      | 18                                | 79                                 | 24  | 54.8 | 86.0 | 99.3  |
| 15    | W04146      | BW720/W98571         | 281                                 | 36  | 188                                 | 33.1      | 25                                | 65                                 | 28  | 55.0 | 86.5 | 100.7 |
| 16    | W04465      | BW720/FHB9           | 270                                 | 47  | 167                                 | 38.0      | 49                                | 90                                 | 32  | 57.0 | 87.0 | 100.0 |
| 17    | W05020      | Teal/BW173(F3)//Teal | 259                                 | 54  | 166                                 | 36.1      | 37                                | 79                                 | 31  | 56.5 | 88.0 | 97.0  |
| 18    | W05021      | Teal/BW173(F3)//Teal | 262                                 | 50  | 175                                 | 33.2      | 26                                | 85                                 | 24  | 56.3 | 88.3 | 99.3  |
| 19    | W05034      | Teal/BW277           | 339                                 | 9   | 246                                 | 27.5      | 3                                 | 86                                 | 31  | 55.3 | 85.0 | 100.0 |
| 20    | W05227      | W98332/W98001        | 260                                 | 52  | 177                                 | 32.1      | 19                                | 75                                 | 26  | 56.0 | 84.8 | 96.3  |
| 21    | W05248      | Teal*3/BW173         | 275                                 | 38  | 182                                 | 34.0      | 29                                | 92                                 | 24  | 56.5 | 88.0 | 94.0  |
| 22    | W05288      | W98001/99WB8         | 285                                 | 31  | 200                                 | 30.0      | 13                                | 73                                 | 27  | 55.3 | 86.0 | 104.3 |
| 23    | W05325      | MS*7/661             | 272                                 | 43  | 193                                 | 29.0      | 6                                 | 67                                 | 22  | 55.5 | 85.3 | 101.7 |
| 24    | W05335      | BW720*2/BW278        | 272                                 | 42  | 184                                 | 32.3      | 20                                | 76                                 | 29  | 57.8 | 88.0 | 105.3 |
| 25    | W05353      | 03Path rows          | 267                                 | 49  | 183                                 | 31.4      | 15                                | 73                                 | 20  | 53.5 | 86.0 | 105.0 |
| 26    | W05355      | 03Path rows          | 255                                 | 55  | 180                                 | 29.4      | 9                                 | 85                                 | 20  | 55.8 | 84.3 | 102.0 |
| 27    | W05369      | Bounty/BW282         | 285                                 | 33  | 189                                 | 33.8      | 28                                | 77                                 | 27  | 53.8 | 85.3 | 98.0  |
| 28    | W05376      | Bounty/BW282         | 295                                 | 25  | 187                                 | 36.6      | 39                                | 92                                 | 25  | 53.5 | 83.5 | 89.0  |
| 29    | W05378      | Bounty/BW282         | 311                                 | 17  | 213                                 | 31.7      | 16                                | 72                                 | 29  | 55.5 | 85.8 | 104.7 |
| 30    | W05420      | BW 282/P99.51-145    | 293                                 | 26  | 196                                 | 33.2      | 27                                | 90                                 | 31  | 53.5 | 85.5 | 88.7  |
| 31    | W06125      | BW751/BW279          | 273                                 | 40  | 183                                 | 33.0      | 23                                | 90                                 | 24  | 59.8 | 89.0 | 97.3  |

|    |         |                  |     |    |     |      |    |      |      |      |      |       |
|----|---------|------------------|-----|----|-----|------|----|------|------|------|------|-------|
| 32 | W06167  | Bounty/BW282     | 270 | 45 | 161 | 40.5 | 54 | 105  | 34   | 56.0 | 86.3 | 101.3 |
| 33 | W06170  | Bounty/BW282     | 270 | 46 | 158 | 41.4 | 58 | 86   | 28   | 54.8 | 84.3 | 95.7  |
| 34 | W06177  | BW282/P99.51-145 | 261 | 51 | 163 | 37.5 | 43 | 94   | 33   | 58.0 | 87.5 | 100.7 |
| 35 | W06180  | BW252*2/W98616   | 302 | 21 | 202 | 33.0 | 24 | 92   | 27   | 53.8 | 87.3 | 87.3  |
| 36 | W06192  | BW781/BW243      | 292 | 28 | 174 | 40.3 | 53 | 104  | 36   | 54.0 | 84.8 | 80.7  |
| 37 | W06200  | BW781/BW282      | 351 | 4  | 249 | 29.1 | 8  | 105  | 29   | 52.8 | 86.5 | 79.3  |
| 38 | W06210  | BW781/PT554      | 293 | 27 | 182 | 37.9 | 48 | 106  | 32   | 53.8 | 91.5 | 78.0  |
| 39 | W06213  | BW781/Bounty     | 304 | 20 | 190 | 37.4 | 42 | 103  | 28   | 54.0 | 88.5 | 84.3  |
| 40 | W06214  | BW781/Bounty     | 250 | 57 | 145 | 42.1 | 60 | 102  | 35   | 56.0 | 87.0 | 83.0  |
| 41 | W06215  | BW781/Bounty     | 323 | 14 | 170 | 47.4 | 64 | 102  | 30   | 55.8 | 88.0 | 93.7  |
| 42 | W06267  | W99058/BW781     | 310 | 18 | 201 | 35.3 | 33 | 99   | 30   | 54.5 | 90.5 | 85.7  |
| 43 | W06288  | W99127/BW781     | 300 | 23 | 186 | 37.9 | 47 | 91   | 27   | 53.8 | 87.0 | 90.3  |
| 44 | W06290  | W99127/BW781     | 344 | 6  | 214 | 37.7 | 46 | 96   | 24   | 55.3 | 90.8 | 85.7  |
| 45 | W06305  | W00703/BW282     | 276 | 37 | 176 | 36.1 | 38 | 83   | 24   | 55.8 | 86.0 | 96.7  |
| 46 | W06314  | W00703/BW282     | 307 | 19 | 185 | 39.8 | 51 | 97   | 34   | 56.8 | 87.0 | 95.7  |
| 47 | W06317  | W00703/BW282     | 288 | 29 | 186 | 35.4 | 34 | 84   | 27   | 55.3 | 86.5 | 98.3  |
| 48 | W06324  | W00703/BW282     | 250 | 58 | 156 | 37.6 | 44 | 79   | 34   | 57.8 | 87.3 | 97.3  |
| 49 | W06325  | W00703/BW282     | 260 | 53 | 171 | 34.3 | 30 | 82   | 28   | 53.5 | 83.5 | 90.3  |
| 50 | W06354  | Teal/P00.06-66   | 327 | 13 | 237 | 27.3 | 2  | 90   | 24   | 56.0 | 83.5 | 99.0  |
| 51 | W06359  | Teal/P00.06-77   | 350 | 5  | 229 | 34.6 | 31 | 81   | 27   | 56.0 | 87.3 | 96.7  |
| 52 | W06367  | Teal/P00.06-77   | 342 | 7  | 245 | 28.3 | 5  | 88   | 30   | 57.0 | 86.3 | 102.0 |
| 53 | W06369  | Teal/P00.38-33   | 296 | 24 | 185 | 37.6 | 45 | 96   | 37   | 56.3 | 89.5 | 98.7  |
| 54 | W06382  | Bounty/W00703    | 282 | 34 | 182 | 35.6 | 35 | 78   | 24   | 58.5 | 88.8 | 101.7 |
| 55 | W06408  | Knudson/BW282    | 367 | 2  | 236 | 35.9 | 36 | 91   | 28   | 56.3 | 90.3 | 84.7  |
| 56 | W06416  | Knudson/BW282    | 301 | 22 | 180 | 40.2 | 52 | 97   | 29   | 54.0 | 85.8 | 83.0  |
| 57 | W06417  | Knudson/BW282    | 352 | 3  | 203 | 42.2 | 61 | 85   | 23   | 56.3 | 86.8 | 83.0  |
| 58 | W06423  | Knudson/BW282    | 334 | 10 | 244 | 27.0 | 1  | 80   | 25   | 52.8 | 83.3 | 91.3  |
| 59 | W06425  | Knudson/BW282    | 285 | 30 | 158 | 44.6 | 63 | 93   | 37   | 54.3 | 88.8 | 77.3  |
| 60 | W06442  | BW256/P99.51-73  | 244 | 60 | 165 | 32.4 | 22 | 73   | 27   | 57.8 | 86.3 | 100.7 |
| 61 | W06461  | BW259/P00.06-66  | 375 | 1  | 265 | 29.4 | 10 | 86   | 28   | 56.0 | 87.8 | 106.7 |
| 62 | W06473  | BW259/P00.06-77  | 341 | 8  | 240 | 29.5 | 11 | 77   | 23   | 55.3 | 86.3 | 102.3 |
| 63 | W06474  | BW259/P00.06-77  | 329 | 12 | 207 | 37.2 | 41 | 73   | 25   | 55.5 | 84.0 | 95.3  |
| 64 | W06477  | BW259/P00.38-33  | 285 | 32 | 170 | 40.6 | 55 | 96   | 36   | 56.3 | 90.5 | 94.0  |
|    | Average |                  | 288 |    | 187 | 35.1 |    | 87   | 28   | 55.7 | 86.8 | 96.1  |
|    | CV      |                  | 7.3 |    | 8.6 |      |    | 13.3 | 24.7 | 1.2  | 2.8  | 3.3   |
|    | LSD     |                  | 25  |    | 19  |      |    | 14   | 8    | 0.8  | 2.9  | 4.2   |
|    | REPS    |                  | 4   |    | 4   |      |    | 4    | 4    | 4    | 4    | 3     |

**Table 11. 2008 Evaluation of CDC elite bread wheat lines for competitive ability**

| ENTRY | NAME        | PEDIGREE          | NW<br>wheat<br>yield |     | Weedy<br>wheat<br>yield |      | %<br>redn | Rnk | Oat<br>yield<br>g m <sup>2</sup> | Must<br>yield<br>g m <sup>2</sup> | DSE<br>days | Ht<br>cm |
|-------|-------------|-------------------|----------------------|-----|-------------------------|------|-----------|-----|----------------------------------|-----------------------------------|-------------|----------|
|       |             |                   | g m <sup>-2</sup>    | Rnk | g m <sup>-2</sup>       |      |           |     |                                  |                                   |             |          |
| 1     | AC Barrie   |                   | 365                  | 25  | 201                     | 44.9 | 19        | 71  | 76                               | 52.5                              | 85.5        |          |
| 2     | AC Superb   |                   | 456                  | 3   | 259                     | 43.1 | 13        | 65  | 75                               | 50.0                              | 85.0        |          |
| 3     | AC Elsa     |                   | 377                  | 22  | 216                     | 42.8 | 10        | 63  | 88                               | 52.0                              | 80.0        |          |
| 4     | AC Splendor |                   | 318                  | 35  | 168                     | 47.3 | 25        | 73  | 90                               | 48.5                              | 81.5        |          |
| 5     | CDC Go      |                   | 389                  | 15  | 221                     | 43.0 | 11        | 65  | 76                               | 47.0                              | 74.5        |          |
| 6     | CDC Merlin  |                   | 332                  | 33  | 131                     | 60.4 | 36        | 92  | 114                              | 54.0                              | 96.0        |          |
| 7     | Marquis     |                   | 255                  | 36  | 145                     | 43.1 | 12        | 68  | 92                               | 55.0                              | 102.0       |          |
| 8     | Red Fife    |                   | 435                  | 7   | 270                     | 37.8 | 2         | 66  | 68                               | 55.0                              | 107.0       |          |
| 9     | cdc Bounty  |                   | 354                  | 28  | 177                     | 50.1 | 30        | 69  | 93                               | 54.5                              | 90.5        |          |
| 10    | Lovitt      |                   | 335                  | 32  | 166                     | 50.5 | 32        | 79  | 97                               | 53.0                              | 85.0        |          |
| 11    | W03209      | Teal/FHB9         | 364                  | 26  | 205                     | 43.7 | 15        | 67  | 84                               | 52.0                              | 89.5        |          |
| 12    | W03215      | Teal/FHB9         | 408                  | 14  | 198                     | 51.6 | 33        | 57  | 68                               | 53.0                              | 85.5        |          |
| 13    | W04138      | BW252/W98571      | 354                  | 29  | 214                     | 39.4 | 4         | 72  | 80                               | 50.0                              | 82.0        |          |
| 14    | W04146      | BW720/W98571      | 414                  | 11  | 230                     | 44.5 | 17        | 73  | 76                               | 50.0                              | 86.0        |          |
| 15    | W05034      | Teal/BW277        | 385                  | 16  | 209                     | 45.9 | 20        | 59  | 99                               | 52.5                              | 80.0        |          |
| 16    | W05227      | W98332/W98001     | 373                  | 24  | 209                     | 43.9 | 16        | 87  | 100                              | 54.5                              | 88.0        |          |
| 17    | W05248      | Teal*3/BW173      | 385                  | 17  | 224                     | 41.7 | 8         | 71  | 86                               | 52.0                              | 83.5        |          |
| 18    | W05288      | W98001/99WB8      | 384                  | 18  | 180                     | 53.2 | 35        | 50  | 86                               | 52.0                              | 86.0        |          |
| 19    | W05325      | MS*7/661          | 358                  | 27  | 209                     | 41.7 | 7         | 58  | 76                               | 51.5                              | 86.0        |          |
| 20    | W05335      | BW720*2/BW278     | 411                  | 12  | 264                     | 35.8 | 1         | 78  | 61                               | 52.5                              | 87.5        |          |
| 21    | W05353      | 03Path rows       | 379                  | 21  | 227                     | 40.2 | 5         | 64  | 70                               | 49.0                              | 86.5        |          |
| 22    | W05355      | 03Path rows       | 349                  | 31  | 188                     | 46.1 | 21        | 78  | 93                               | 51.5                              | 86.0        |          |
| 23    | W05369      | Bounty/BW282      | 353                  | 30  | 189                     | 46.4 | 24        | 69  | 82                               | 50.5                              | 83.0        |          |
| 24    | W05378      | Bounty/BW282      | 380                  | 20  | 200                     | 47.4 | 26        | 54  | 85                               | 51.0                              | 80.5        |          |
| 25    | W05420      | BW 282/P99.51-145 | 373                  | 23  | 178                     | 52.3 | 34        | 64  | 98                               | 50.5                              | 75.5        |          |
| 26    | W06125      | BW751/BW279       | 456                  | 2   | 246                     | 46.2 | 22        | 64  | 85                               | 54.0                              | 94.5        |          |
| 27    | W06180      | BW252*2/W98616    | 427                  | 8   | 229                     | 46.4 | 23        | 60  | 80                               | 49.0                              | 79.0        |          |
| 28    | W06200      | BW781/BW282       | 426                  | 9   | 260                     | 39.0 | 3         | 69  | 60                               | 48.0                              | 70.5        |          |
| 29    | W06325      | W00703/BW282      | 321                  | 34  | 159                     | 50.4 | 31        | 75  | 80                               | 48.5                              | 72.5        |          |
| 30    | W06354      | Teal/P00.06-66    | 438                  | 5   | 243                     | 44.6 | 18        | 66  | 86                               | 52.5                              | 88.5        |          |
| 31    | W06359      | Teal/P00.06-77    | 459                  | 1   | 231                     | 49.6 | 29        | 70  | 88                               | 50.5                              | 82.5        |          |

|    |         |                 |     |    |      |      |    |      |      |      |      |
|----|---------|-----------------|-----|----|------|------|----|------|------|------|------|
| 32 | W06367  | Teal/P00.06-77  | 454 | 4  | 261  | 42.6 | 9  | 79   | 73   | 52.5 | 85.5 |
| 33 | W06423  | Knudson/BW282   | 383 | 19 | 200  | 47.8 | 27 | 78   | 94   | 49.0 | 76.0 |
| 34 | W06461  | BW259/P00.06-66 | 435 | 6  | 226  | 48.1 | 28 | 67   | 96   | 52.5 | 91.0 |
| 35 | W06473  | BW259/P00.06-77 | 422 | 10 | 248  | 41.2 | 6  | 69   | 74   | 51.5 | 86.0 |
| 36 | W06474  | BW259/P00.06-77 | 408 | 13 | 232  | 43.3 | 14 | 75   | 82   | 53.0 | 84.5 |
|    | Average |                 | 387 |    | 211  | 45.3 |    | 69   | 84   | 51.5 | 85.1 |
|    | CV      |                 | 6.6 |    | 16.7 |      |    | 23.5 | 20.2 | 1.7  | 3.5  |
|    | LSD     |                 | 30  |    | 41   |      |    | 19   | 20   | 1.5  | 5.0  |
|    | REPS    |                 | 4   |    | 4    |      |    | 4    | 4    | 2    | 2    |

**Table 12. Summary of CDC bread wheat populations subjected to divergent selection (weedy versus non-weedy conditions) from 2004 to 2008.**

|         |                   | 2004 | 2004   | 2005 | 2005   | 2006 | 2006   | 2007 | 2007    | 2008 | 2008   |
|---------|-------------------|------|--------|------|--------|------|--------|------|---------|------|--------|
| Cross   | Pedigree          | Gen  | format | Gen  | format | Gen  | format | Gen  | format  | Gen  | format |
| x02.217 | BW297/W98332      | F4   | bulk   | F5   | bulk   | F6   | hill   | F7   | microYT | F8   | repYT  |
| x02.218 | BW297/BW314       | F4   | bulk   | F5   | bulk   | F6   | hill   | F7   | microYT | F8   | repYT  |
| x02.219 | BW297/BW799       | F4   | bulk   | F5   | bulk   | F6   | hill   | F7   | microYT | F8   | repYT  |
| x02.228 | BW799/W98332      | F4   | bulk   | F5   | bulk   | F6   | hill   | F7   | microYT | F8   | repYT  |
| x02.229 | BW799/Alsen       | F4   | bulk   | F5   | bulk   | F6   | hill   | F7   | microYT | F8   | repYT  |
| x02.230 | BW799/W00201      | F4   | bulk   | F5   | bulk   | F6   | hill   | F7   | microYT | F8   | repYT  |
| x02.231 | BW799/W00219      | F4   | bulk   | F5   | bulk   | F6   | hill   | F7   | microYT | F8   | repYT  |
| x02.232 | BW799/W00294      | F4   | bulk   | F5   | bulk   | F6   | hill   | F7   | microYT | F8   | repYT  |
| x02.233 | BW799/W00347      | F4   | bulk   | F5   | bulk   | F6   | hill   | F7   | microYT | F8   | repYT  |
| x02.234 | BW799/W99171      | F4   | bulk   | F5   | bulk   | F6   | hill   | F7   | microYT | F8   | repYT  |
| x02.235 | BW799/W00174      | F4   | bulk   | F5   | bulk   | F6   | hill   | F7   | microYT | F8   | repYT  |
| x02.238 | BW314/Alsen       | F4   | bulk   | F5   | bulk   | F6   | hill   | F7   | microYT | F8   | repYT  |
| x02.244 | BW314/BW799       | F4   | bulk   | F5   | bulk   | F6   | hill   | F7   | microYT | F8   | repYT  |
| x02.245 | BW314/W98332      | F4   | bulk   | F5   | bulk   | F6   | hill   | F7   | microYT | F8   | repYT  |
| x02.18  | Bounty/BW243      | F4   | bulk   | F5   | bulk   | F6   | hill   | F7   | microYT | F8   | repYT  |
| x02.19  | Bounty/BW781      | F4   | bulk   | F5   | bulk   | F6   | hill   | F7   | microYT | F8   | repYT  |
| x02.28  | BW 256/BW781      | F4   | bulk   | F5   | bulk   | F6   | hill   | F7   | microYT | F8   | repYT  |
| x02.29  | BW 256/P00.02-56  | F4   | bulk   | F5   | bulk   | F6   | hill   | F7   | microYT | F8   | repYT  |
| x02.30  | BW 256/P00.05-86  | F4   | bulk   | F5   | bulk   | F6   | hill   | F7   | microYT | F8   | repYT  |
| x02.31  | BW 256/P00.06-66  | F4   | bulk   | F5   | bulk   | F6   | hill   | F7   | microYT | F8   | repYT  |
| x02.32  | BW 256/P00.06-72  | F4   | bulk   | F5   | bulk   | F6   | hill   | F7   | microYT | F8   | repYT  |
| x02.33  | BW 256/P00.06-77  | F4   | bulk   | F5   | bulk   | F6   | hill   | F7   | microYT | F8   | repYT  |
| x02.35  | BW 256/P00.38-39  | F4   | bulk   | F5   | bulk   | F6   | hill   | F7   | hill    | F8   | rowYT  |
| x02.36  | BW 256/P00.38-9   | F4   | bulk   | F5   | bulk   | F6   | hill   | F7   | hill    | F8   | rowYT  |
| x02.37  | BW 256/P99.51-142 | F4   | bulk   | F5   | bulk   | F6   | hill   | F7   | hill    | F8   | rowYT  |
| x02.38  | BW 256/P99.51-145 | F4   | bulk   | F5   | bulk   | F6   | hill   | F7   | hill    | F8   | rowYT  |
| x02.39  | BW 256/P99.51-41  | F4   | bulk   | F5   | bulk   | F6   | hill   | F7   | hill    | F8   | rowYT  |
| x02.40  | BW 256/P99.51-73  | F4   | bulk   | F5   | bulk   | F6   | hill   | F7   | hill    | F8   | rowYT  |
| x02.41  | BW 256/P99.51-79  | F4   | bulk   | F5   | bulk   | F6   | hill   | F7   | hill    | F8   | rowYT  |
| x02.42  | BW 256/W99621     | F4   | bulk   | F5   | bulk   | F6   | hill   | F7   | hill    | F8   | rowYT  |
| x02.43  | BW 259/P00.02-56  | F4   | bulk   | F5   | bulk   | F6   | hill   | F7   | hill    | F8   | rowYT  |
| x02.44  | BW 259/P00.05-86  | F4   | bulk   | F5   | bulk   | F6   | hill   | F7   | hill    | F8   | rowYT  |
| x02.45  | BW 259/P00.06-66  | F4   | bulk   | F5   | bulk   | F6   | hill   | F7   | hill    | F8   | rowYT  |
| x02.46  | BW 259/P00.06-72  | F4   | bulk   | F5   | bulk   | F6   | hill   | F7   | hill    | F8   | rowYT  |
| x02.47  | BW 259/P00.06-77  | F4   | bulk   | F5   | bulk   | F6   | hill   | F7   | hill    | F8   | rowYT  |
| x02.48  | BW 259/P00.38-33  | F4   | bulk   | F5   | bulk   | F6   | hill   | F7   | hill    | F8   | rowYT  |
| x02.49  | BW 259/P00.38-39  | F4   | bulk   | F5   | bulk   | F6   | hill   | F7   | hill    | F8   | rowYT  |
| x02.50  | BW 259/P00.38-9   | F4   | bulk   | F5   | bulk   | F6   | hill   | F7   | hill    | F8   | rowYT  |
| x02.51  | BW 259/P99.51-142 | F4   | bulk   | F5   | bulk   | F6   | hill   | F7   | hill    | F8   | rowYT  |
| x02.52  | BW 259/P99.51-145 | F4   | bulk   | F5   | bulk   | F6   | hill   | F7   | hill    | F8   | rowYT  |
| x02.53  | BW 259/P99.51-41  | F4   | bulk   | F5   | bulk   | F6   | hill   | F7   | hill    | F8   | rowYT  |
| x02.54  | BW 259/P99.51-73  | F4   | bulk   | F5   | bulk   | F6   | hill   | F7   | hill    | F8   | rowYT  |
| x02.55  | BW 259/P99.51-79  | F4   | bulk   | F5   | bulk   | F6   | hill   | F7   | hill    | F8   | rowYT  |
| x02.95  | BW 781/P00.02-56  | F4   | bulk   | F5   | bulk   | F6   | hill   | F7   | hill    | F8   | rowYT  |
| x02.96  | BW 781/P00.05-86  | F4   | bulk   | F5   | bulk   | F6   | hill   | F7   | hill    | F8   | rowYT  |

|         |                          |    |      |    |      |    |      |    |      |    |       |
|---------|--------------------------|----|------|----|------|----|------|----|------|----|-------|
| x02.97  | BW 781/P00.06-66         | F4 | bulk | F5 | bulk | F6 | hill | F7 | hill | F8 | rowYT |
| x02.98  | BW 781/P00.06-72         | F4 | bulk | F5 | bulk | F6 | hill | F7 | hill | F8 | rowYT |
| x02.99  | BW 781/P00.06-77         | F4 | bulk | F5 | bulk | F6 | hill | F7 | hill | F8 | rowYT |
| x02.100 | BW 781/P00.38-33         | F4 | bulk | F5 | bulk | F6 | hill | F7 | hill | F8 | rowYT |
| x02.101 | BW 781/P00.38-39         | F4 | bulk | F5 | bulk | F6 | hill | F7 | hill | F8 | rowYT |
| x02.102 | BW 781/P00.38-9          | F4 | bulk | F5 | bulk | F6 | hill | F7 | hill | F8 | rowYT |
| x02.103 | BW 781/P99.51-142        | F4 | bulk | F5 | bulk | F6 | hill | F7 | hill | F8 | rowYT |
| x02.104 | BW 781/P99.51-145        | F4 | bulk | F5 | bulk | F6 | hill | F7 | hill | F8 | rowYT |
| x02.105 | BW 781/P99.51-41         | F4 | bulk | F5 | bulk | F6 | hill | F7 | hill | F8 | rowYT |
| x02.106 | BW 781/P99.51-73         | F4 | bulk | F5 | bulk | F6 | hill | F7 | hill | F8 | rowYT |
| x02.107 | BW 781/P99.51-79         | F4 | bulk | F5 | bulk | F6 | hill | F7 | hill | F8 | rowYT |
| x02.114 | PT555/99FHB68            | F4 | bulk | F5 | bulk | F6 | hill | F7 | hill | F8 | rowYT |
| x02.115 | PT555/BW316              | F4 | bulk | F5 | bulk | F6 | hill | F7 | hill | F8 | rowYT |
| x02.116 | PT555/W01473             | F4 | bulk | F5 | bulk | F6 | hill | F7 | hill | F8 | rowYT |
| x02.117 | PT555/W01474             | F4 | bulk | F5 | bulk | F6 | hill | F7 | hill | F8 | rowYT |
| x02.118 | PT555/W01475             | F4 | bulk | F5 | bulk | F6 | hill | F7 | hill | F8 | rowYT |
| x02.119 | PT555/W01487             | F4 | bulk | F5 | bulk | F6 | hill | F7 | hill | F8 | rowYT |
| x02.120 | PT555/W01492             | F4 | bulk | F5 | bulk | F6 | hill | F7 | hill | F8 | rowYT |
| x02.121 | PT555/W01493             | F4 | bulk | F5 | bulk | F6 | hill | F7 | hill | F8 | rowYT |
| x02.122 | PT555/W01494             | F4 | bulk | F5 | bulk | F6 | hill | F7 | hill | F8 | rowYT |
| x02.123 | PT555/W01496             | F4 | bulk | F5 | bulk | F6 | hill | F7 | hill | F8 | rowYT |
| x02.135 | PT559/W01473             | F4 | bulk | F5 | bulk | F6 | hill | F7 | hill | F8 | rowYT |
| x02.136 | PT559/W01474             | F4 | bulk | F5 | bulk | F6 | hill | F7 | hill | F8 | rowYT |
| x02.137 | PT559/W01475             | F4 | bulk | F5 | bulk | F6 | hill | F7 | hill | F8 | rowYT |
| x02.138 | PT559/W01487             | F4 | bulk | F5 | bulk | F6 | hill | F7 | hill | F8 | rowYT |
| x02.139 | PT559/W01492             | F4 | bulk | F5 | bulk | F6 | hill | F7 | hill | F8 | rowYT |
| x02.140 | PT559/W01493             | F4 | bulk | F5 | bulk | F6 | hill | F7 | hill | F8 | rowYT |
| x02.141 | PT559/W01494             | F4 | bulk | F5 | bulk | F6 | hill | F7 | hill | F8 | rowYT |
| x02.142 | PT559/W01496             | F4 | bulk | F5 | bulk | F6 | hill | F7 | hill | F8 | rowYT |
| x01.254 | BW720/BW252/W98096       | F4 | bulk | F5 | bulk | F6 | hill | F7 | hill | F8 | rowYT |
| x01.254 | BW720/BW252/W98096       | F4 | bulk | F5 | bulk | F6 | hill | F7 | hill | F8 | rowYT |
| x02.34  | BW 256/P00.38-33         | F4 | bulk | F5 | bulk | F6 | hill | F7 | hill | F8 | rowYT |
| x02.134 | PT559/BW316              | F4 | bulk | F5 | bulk | F6 | hill | F7 | hill | F8 | rowYT |
| x02.220 | BW297/W99171             | F4 | bulk | F5 | bulk | F6 | hill | F7 | hill | F8 | rowYT |
| x02.227 | BW791/BW297              | F4 | bulk | F5 | bulk | F6 | hill | F7 | hill | F8 | rowYT |
| x03.43  | Alsen*2/P00.06-33        | F2 | bulk | F3 | bulk | F4 | bulk | F5 | bulk | F6 | hill  |
| x03.44  | Alsen*2/P00.06-78        | F2 | bulk | F3 | bulk | F4 | bulk | F5 | bulk | F6 | hill  |
| x03.45  | Alsen*2/P00.38-15        | F2 | bulk | F3 | bulk | F4 | bulk | F5 | bulk | F6 | hill  |
| x03.46  | Alsen//99FHB68/X00.148#6 | F2 | bulk | F3 | bulk | F4 | bulk | F5 | bulk | F6 | hill  |
| x03.47  | Alsen/BW252              | F2 | bulk | F3 | bulk | F4 | bulk | F5 | bulk | F6 | hill  |
| x03.48  | Alsen/W01361             | F2 | bulk | F3 | bulk | F4 | bulk | F5 | bulk | F6 | hill  |
| x03.53  | Alsen/W01155             | F2 | bulk | F3 | bulk | F4 | bulk | F5 | bulk | F6 | hill  |
| x03.54  | Alsen/W01137             | F2 | bulk | F3 | bulk | F4 | bulk | F5 | bulk | F6 | hill  |
| x03.55  | Alsen/W01078             | F2 | bulk | F3 | bulk | F4 | bulk | F5 | bulk | F6 | hill  |
| x03.56  | Alsen/W01135             | F2 | bulk | F3 | bulk | F4 | bulk | F5 | bulk | F6 | hill  |
| x03.59  | Alsen/W01479             | F2 | bulk | F3 | bulk | F4 | bulk | F5 | bulk | F6 | hill  |
| x04.80  | BW297/W01100             |    |      |    |      | F3 | bulk | F4 | bulk | F5 | bulk  |
| x04.81  | BW297/W01487             |    |      |    |      | F3 | bulk | F4 | bulk | F5 | bulk  |
| x04.82  | BW297/W02073             |    |      |    |      | F3 | bulk | F4 | bulk | F5 | bulk  |
| x04.83  | BW297/W02074             |    |      |    |      | F3 | bulk | F4 | bulk | F5 | bulk  |
| x04.84  | BW297/W02142             |    |      |    |      | F3 | bulk | F4 | bulk | F5 | bulk  |

|        |                           |  |  |  |  |    |      |    |      |    |      |
|--------|---------------------------|--|--|--|--|----|------|----|------|----|------|
| x04.85 | BW297/W02143              |  |  |  |  | F3 | bulk | F4 | bulk | F5 | bulk |
| x04.86 | BW297/W02200              |  |  |  |  | F3 | bulk | F4 | bulk | F5 | bulk |
| x04.87 | BW297/W02330              |  |  |  |  | F3 | bulk | F4 | bulk | F5 | bulk |
| x04.88 | BW297/CRGB-O-623.4        |  |  |  |  | F3 | bulk | F4 | bulk | F5 | bulk |
| x04.89 | BW297/Choteau             |  |  |  |  | F3 | bulk | F4 | bulk | F5 | bulk |
| x04.90 | BW297/Outlook             |  |  |  |  | F3 | bulk | F4 | bulk | F5 | bulk |
| x04.91 | BW297/MT0245              |  |  |  |  | F3 | bulk | F4 | bulk | F5 | bulk |
| x04.92 | BW297/Hanna               |  |  |  |  | F3 | bulk | F4 | bulk | F5 | bulk |
| x04.93 | BW297/Freyr               |  |  |  |  | F3 | bulk | F4 | bulk | F5 | bulk |
| x04.94 | BW297/Knudson             |  |  |  |  | F3 | bulk | F4 | bulk | F5 | bulk |
| X05.27 | BW844/Harvest             |  |  |  |  |    |      | F3 | bulk | F4 | bulk |
| X05.28 | BW844/PT211               |  |  |  |  |    |      | F3 | bulk | F4 | bulk |
| X05.29 | BW844/Lovitt              |  |  |  |  |    |      | F3 | bulk | F4 | bulk |
| X05.30 | BW845/Harvest             |  |  |  |  |    |      | F3 | bulk | F4 | bulk |
| X05.31 | BW845/PT211               |  |  |  |  |    |      | F3 | bulk | F4 | bulk |
| X05.32 | BW845/Lovitt              |  |  |  |  |    |      | F3 | bulk | F4 | bulk |
| X05.33 | BW845/BW865               |  |  |  |  |    |      | F3 | bulk | F4 | bulk |
| X05.34 | BW845/W03032              |  |  |  |  |    |      | F3 | bulk | F4 | bulk |
| X05.36 | BW337/Harvest             |  |  |  |  |    |      | F3 | bulk | F4 | bulk |
| X05.37 | BW337/PT211               |  |  |  |  |    |      | F3 | bulk | F4 | bulk |
| X05.38 | BW337/BW865               |  |  |  |  |    |      | F3 | bulk | F4 | bulk |
| X05.39 | BW337//Alsen/CRGB-O-623.4 |  |  |  |  |    |      | F3 | bulk | F4 | bulk |

microYT = microplot yield trial; repYT = replicated yield trial; rowYT = single row yield trial

**Table 13. Wheat, oat and mustard grain yields (LS means) for 22 populations undergoing divergent selection under non-weedy versus weedy conditions in a microplot nursery in 2007.**

| <b>Group 1:</b>                                | <b>NW<br/>wheat</b>     | <b>Weedy<br/>wheat</b>  |                   | <b>Oat</b>              | <b>Mustard</b>          |      |
|------------------------------------------------|-------------------------|-------------------------|-------------------|-------------------------|-------------------------|------|
| <b>Wheat</b>                                   | <b>yield</b>            | <b>yield</b>            |                   | <b>yield</b>            | <b>yield</b>            |      |
| <b>Population</b>                              | <b>g m<sup>-2</sup></b> | <b>g m<sup>-2</sup></b> | <b>%<br/>redn</b> | <b>g m<sup>-2</sup></b> | <b>g m<sup>-2</sup></b> |      |
| X02.217                                        | 281                     | 114                     | 59.6              | 103                     | 120                     |      |
| X02.218                                        | 303                     | 116                     | 61.7              | 99                      | 99                      |      |
| X02.219                                        | 304                     | 120                     | 60.6              | 113                     | 93                      |      |
| X02.228                                        | 277                     | 135                     | 51.4              | 111                     | 88                      |      |
| X02.229                                        | 249                     | 109                     | 56.4              | 129                     | 73                      |      |
| X02.230                                        | 279                     | 132                     | 52.6              | 118                     | 74                      |      |
| X02.231                                        | 303                     | 128                     | 57.7              | 91                      | 100                     |      |
| X02.232                                        | 268                     | 118                     | 56.1              | 108                     | 93                      |      |
| X02.233                                        | 265                     | 143                     | 46.1              | 108                     | 68                      |      |
| X02.234                                        | 293                     | 133                     | 54.7              | 106                     | 77                      |      |
| X02.235                                        | 277                     | 135                     | 51.4              | 111                     | 71                      |      |
| X02.238                                        | 281                     | 126                     | 55.3              | 100                     | 111                     |      |
| X02.244                                        | 309                     | 157                     | 49.2              | 120                     | 63                      |      |
| X02.245                                        | 261                     | 124                     | 52.5              | 128                     | 110                     |      |
| <b>Average</b>                                 | <b>282</b>              | <b>128</b>              | <b>54.7</b>       | <b>110</b>              | <b>89</b>               |      |
| <b>LSD(0.05)</b>                               |                         | 15                      |                   | 9                       | 9                       |      |
| Population x weed regime for wheat yield = *** |                         |                         |                   |                         |                         |      |
| <b>Checks</b>                                  |                         |                         |                   |                         |                         |      |
| AC Barrie                                      | 293                     | 131                     | 55.2              | 102                     | 78                      | n=84 |
| AC Superb                                      | 281                     | 140                     | 50.0              | 95                      | 78                      | n=55 |
| <b>LSD(0.05)</b>                               |                         | 12                      |                   | NS                      | NS                      |      |
| Cultivar x weed regime for wheat yield = **    |                         |                         |                   |                         |                         |      |
| <b>Group 2:</b>                                |                         |                         |                   |                         |                         |      |
| X02.18                                         | 257                     | 118                     | 54.2              | 117                     | 90                      |      |
| X02.19                                         | 204                     | 97                      | 52.6              | 131                     | 110                     |      |
| X02.28                                         | 221                     | 86                      | 61.3              | 128                     | 108                     |      |
| X02.29                                         | 185                     | 68                      | 63.3              | 159                     | 99                      |      |
| X02.30                                         | 258                     | 80                      | 68.9              | 115                     | 117                     |      |
| X02.31                                         | 239                     | 114                     | 52.3              | 157                     | 95                      |      |
| X02.32                                         | 276                     | 111                     | 59.8              | 131                     | 77                      |      |
| X02.33                                         | 235                     | 109                     | 53.6              | 141                     | 91                      |      |
| <b>Average</b>                                 | <b>234</b>              | <b>98</b>               | <b>58.3</b>       | <b>135</b>              | <b>98</b>               |      |
| <b>LSD(0.05)</b>                               |                         | 20                      |                   | 15                      | 13                      |      |
| Population x weed regime for wheat yield = *** |                         |                         |                   |                         |                         |      |
| <b>Checks</b>                                  |                         |                         |                   |                         |                         |      |
| AC Barrie                                      | 273                     | 133                     | 51.1              | 105                     | 71                      | n=21 |
| AC Superb                                      | 261                     | 134                     | 48.7              | 106                     | 81                      | n=16 |
| <b>LSD(0.05)</b>                               |                         | NS                      |                   | NS                      | NS                      |      |
| Cultivar x weed regime for wheat yield = NS    |                         |                         |                   |                         |                         |      |

**Table 14. Wheat, oat and mustard grain yields (LS means) for nine populations undergoing divergent selection under non-weedy versus weedy conditions in a replicated plot nursery in 2008.**

|                  | NW                |                   | Weedy       |                   |                   |
|------------------|-------------------|-------------------|-------------|-------------------|-------------------|
| Wheat            | wheat yield       | wheat yield       |             | Oat yield         | Mustard yield     |
| Population       | g m <sup>-2</sup> | g m <sup>-2</sup> | % redn      | g m <sup>-2</sup> | g m <sup>-2</sup> |
| X02.217          | 399               | 240               | 39.8        | 64                | 65                |
| X02.218          | 398               | 223               | 44.1        | 61                | 59                |
| X02.219          | 421               | 223               | 46.9        | 77                | 76                |
| X02.228          | 386               | 223               | 42.3        | 63                | 70                |
| X02.229          | 369               | 211               | 42.8        | 66                | 61                |
| X02.230          | 330               | 184               | 44.2        | 74                | 64                |
| X02.231          | 385               | 205               | 46.8        | 77                | 74                |
| X02.232          | 372               | 215               | 42.2        | 78                | 71                |
| X02.233          | 368               | 222               | 39.5        | 75                | 78                |
| <b>Average</b>   | <b>381</b>        | <b>216</b>        | <b>43.2</b> | <b>71</b>         | <b>69</b>         |
| <b>LSD(0.05)</b> |                   | 48                |             | NS                | 11                |

Population x weed regime for wheat yield = NS

|                  |            |            |             |           |           |
|------------------|------------|------------|-------------|-----------|-----------|
| <b>Checks</b>    |            |            |             |           |           |
| AC Barrie        | 304        | 161        | 47.0        | 67        | 64        |
| AC Superb        | 412        | 297        | 27.9        | 67        | 81        |
| CDC              |            |            |             |           |           |
| Bounty           | 344        | 190        | 44.7        | 87        | 91        |
| CDC Go           | 367        | 222        | 39.6        | 54        | 44        |
| CDC Merlin       | 265        | 136        | 48.8        | 74        | 73        |
| Lovitt           | 296        | 165        | 44.4        | 77        | 77        |
| <b>Average</b>   | <b>331</b> | <b>195</b> | <b>42.1</b> | <b>71</b> | <b>72</b> |
| <b>LSD(0.05)</b> |            | 53         |             | NS        | NS        |

Cultivar x weed regime for wheat yield = NS

**Table 15. Wheat, oat and mustard grain yields (LS means) for 13 populations undergoing divergent selection under non-weedy versus weedy conditions in a replicated plot nursery in 2008.**

|                  | NW                | Weedy             |             |                   |                   |
|------------------|-------------------|-------------------|-------------|-------------------|-------------------|
| Wheat            | wheat             | wheat             |             | Oat               | Mustard           |
|                  | yield             | yield             | %           | yield             | yield             |
| Population       | g m <sup>-2</sup> | g m <sup>-2</sup> | redn        | g m <sup>-2</sup> | g m <sup>-2</sup> |
| X02.18           | 348               | 214               | 38.5        | 72                | 52                |
| X02.19           | 340               | 257               | 24.4        | 76                | 53                |
| X02.28           | 350               | 240               | 31.4        | 78                | 56                |
| X02.29           | 321               | 198               | 38.3        | 87                | 60                |
| X02.30           | 337               | 246               | 27.0        | 70                | 51                |
| X02.31           | 376               | 219               | 41.8        | 71                | 56                |
| X02.32           | 365               | 227               | 37.6        | 79                | 62                |
| X02.33           | 382               | 258               | 32.5        | 73                | 64                |
| X02.234          | 340               | 203               | 40.2        | 77                | 62                |
| X02.235          | 341               | 191               | 44.2        | 86                | 76                |
| X02.238          | 372               | 231               | 37.8        | 71                | 60                |
| X02.244          | 355               | 240               | 32.3        | 83                | 74                |
| X02.245          | 356               | 248               | 30.4        | 63                | 54                |
| <b>Average</b>   | <b>352</b>        | <b>229</b>        | <b>35.1</b> | <b>76</b>         | <b>60</b>         |
| <b>LSD(0.05)</b> |                   | 46                |             | 11                | 15                |

Population x weed regime for wheat yield = NS

|                  |            |            |             |           |           |
|------------------|------------|------------|-------------|-----------|-----------|
| <b>Checks</b>    |            |            |             |           |           |
| AC Barrie        | 445        | 203        | 54.3        | 83        | 74        |
| AC Superb        | 346        | 230        | 33.6        | 68        | 42        |
| CDC              |            |            |             |           |           |
| Bounty           | 287        | 212        | 26.0        | 101       | 73        |
| CDC Go           | 298        | 238        | 20.0        | 80        | 45        |
| CDC Merlin       | 297        | 135        | 54.5        | 90        | 78        |
| Lovitt           | 293        | 149        | 49.1        | 90        | 66        |
| <b>Average</b>   | <b>327</b> | <b>195</b> | <b>39.6</b> | <b>85</b> | <b>63</b> |
| <b>LSD(0.05)</b> |            | 53         |             | NS        | NS        |

Cultivar x weed regime for wheat yield = \*

**Table 16. Wheat, oat and mustard grain yields (LS means) for 57 populations undergoing divergent selection under non-weedy versus weedy conditions in a single row plot nursery in 2008.**

| Wheat      | NW<br>wheat<br>yield | Weedy<br>wheat<br>yield |           | Oat<br>yield      | Mustard<br>yield  |
|------------|----------------------|-------------------------|-----------|-------------------|-------------------|
| Population | g m <sup>-2</sup>    | g m <sup>-2</sup>       | %<br>redn | g m <sup>-2</sup> | g m <sup>-2</sup> |
| X01.254    | 365                  | 203                     | 44.3      | 79                | 150               |
| X02.100    | 413                  | 175                     | 57.6      | 60                | 123               |
| X02.101    | 340                  | 208                     | 38.7      | 90                | 126               |
| X02.102    | 308                  | 150                     | 51.2      | 81                | 163               |
| X02.103    | 316                  | 159                     | 49.7      | 67                | 140               |
| X02.104    | 497                  | 171                     | 65.5      | 92                | 174               |
| X02.105    | 372                  | 216                     | 41.8      | 64                | 131               |
| X02.106    | 312                  | 282                     | 9.6       | 77                | 115               |
| X02.107    | 255                  | 119                     | 53.6      | 92                | 131               |
| X02.114    | 404                  | 173                     | 57.1      | 77                | 141               |
| X02.115    | 318                  | 138                     | 56.8      | 96                | 101               |
| X02.116    | 311                  | 153                     | 51.0      | 57                | 86                |
| X02.117    | 328                  | 160                     | 51.3      | 109               | 180               |
| X02.118    | 273                  | 231                     | 15.3      | 82                | 149               |
| X02.119    | 261                  | 196                     | 24.8      | 77                | 128               |
| X02.120    | 383                  | 227                     | 40.7      | 65                | 125               |
| X02.121    | 454                  | 203                     | 55.4      | 115               | 119               |
| X02.122    | 391                  | 207                     | 46.9      | 45                | 109               |
| X02.123    | 409                  | 219                     | 46.4      | 42                | 132               |
| X02.134    | 403                  | 146                     | 63.7      | 89                | 150               |
| X02.135    | 404                  | 183                     | 54.7      | 48                | 95                |
| X02.136    | 279                  | 118                     | 57.7      | 65                | 122               |
| X02.137    | 399                  | 256                     | 36.0      | 88                | 94                |
| X02.138    | 404                  | 230                     | 43.0      | 46                | 88                |
| X02.139    | 331                  | 214                     | 35.2      | 48                | 108               |
| X02.140    | 350                  | 147                     | 57.9      | 41                | 204               |
| X02.141    | 399                  | 251                     | 37.2      | 63                | 123               |
| X02.142    | 383                  | 181                     | 52.9      | 55                | 180               |
| X02.220    | 323                  | 194                     | 39.9      | 66                | 138               |
| X02.227    | 363                  | 189                     | 47.9      | 115               | 109               |
| X02.34     | 241                  | 113                     | 53.2      | 69                | 144               |
| X02.35     | 367                  | 154                     | 58.0      | 129               | 99                |
| X02.36     | 346                  | 133                     | 61.6      | 57                | 128               |
| X02.37     | 322                  | 190                     | 41.1      | 97                | 104               |
| X02.38     | 183                  | 172                     | 6.0       | 146               | 103               |
| X02.39     | 397                  | 160                     | 59.7      | 79                | 138               |
| X02.40     | 369                  | 165                     | 55.3      | 50                | 101               |
| X02.41     | 335                  | 168                     | 49.9      | 90                | 141               |
| X02.42     | 291                  | 160                     | 45.1      | 83                | 189               |
| X02.43     | 301                  | 215                     | 28.5      | 96                | 123               |
| X02.44     | 431                  | 184                     | 57.3      | 79                | 112               |
| X02.45     | 411                  | 235                     | 42.7      | 83                | 125               |
| X02.46     | 271                  | 196                     | 27.6      | 67                | 102               |

|                  |            |            |             |           |            |
|------------------|------------|------------|-------------|-----------|------------|
| X02.47           | 218        | 168        | 22.9        | 90        | 157        |
| X02.48           | 240        | 143        | 40.6        | 94        | 116        |
| X02.49           | 227        | 200        | 12.0        | 68        | 82         |
| X02.50           | 322        | 162        | 49.8        | 120       | 145        |
| X02.51           | 200        | 143        | 28.7        | 79        | 150        |
| X02.52           | 322        | 221        | 31.5        | 124       | 152        |
| X02.53           | 318        | 172        | 46.0        | 104       | 161        |
| X02.54           | 291        | 229        | 21.4        | 99        | 114        |
| X02.55           | 387        | 150        | 61.4        | 127       | 135        |
| X02.95           | 450        | 205        | 54.4        | 92        | 166        |
| X02.96           | 383        | 229        | 40.1        | 40        | 118        |
| X02.97           | 438        | 230        | 47.5        | 68        | 111        |
| X02.98           | 257        | 175        | 31.8        | 55        | 123        |
| X02.99           | 356        | 272        | 23.5        | 88        | 124        |
| <b>Average</b>   | <b>341</b> | <b>187</b> | <b>43.5</b> | <b>80</b> | <b>130</b> |
| <b>Pooled SE</b> |            | 31         |             | 21        | 25         |

Population x weed regime for wheat yield = \*\*\*

|                  |     |     |    |    |     |      |
|------------------|-----|-----|----|----|-----|------|
| Barrie           | 326 | 198 | 39 | 97 | 184 | n=11 |
| Superb           | 313 | 185 | 41 | 91 | 142 | n=11 |
| <b>Pooled SE</b> |     | 23  |    | NS | NS  |      |

Cultivar x weed regime for wheat yield = NS





